EXAMINING FACTORS THAT CONTRIBUTE TO COLLEGE READINESS AND SUCCESS IN AMERICAN SAMOA USING MULTILEVEL LOGISTIC MODELING

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ABSTRACT

This study examined the extent to which student- and teacher-level characteristics in high school and college are associated empirically with high school students' college readiness and success in American Samoa. More specifically, multilevel ordinal logistic regressions were employed to understand the extent to which these characteristics predict five distinct outcomes of college readiness and success. These outcome measures include grades in high school Algebra 2 and English 12 courses, initial English and math course enrollment in college, and earning a degree within three years of initial enrollment (a measure of college success).

Results from the analyses revealed that high school grade point average was related with each of the five outcomes examined in this study. Grade 9 cumulative GPA was postively related with both high school Algebra 2 and English 12 course grades. SAT-10 performance was positively related with grades in Algebra 2 and English 12 courses while student absenteeism had a negative effect on each of the grades in Algebra 2 and English 12 courses. The relationship between SAT-10 performance and student absenteeism and grades in Algebra 2 and English 12 courses however, varied by high school cohorts. Additionally, teacher absenteeism was negatively related with students' grades in Algebra 2 and English 12 courses. High school cumulative GPA, grade 12 SAT-10 Reading score and grade 12 absenteeism were associated with students' initial enrollment in a college-level English course. In addition to high school cumulative GPA, attempting more rigorous math courses above Algebra 2 had a positive effect on enrolling directly into a college-level math course.

The findings of this study offer local leaders in American Samoa empirical evidence to support efforts aimed at improving students' college readiness and success. More specifically,

raising the academic preparation trajectory in high school and using high school data, including high school GPA, course taking, and test performance for placement decisions may help improve students' transition from high school to college in American Samoa.

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CHAPTER 1

INTRODUCTION

In the last decade, more than 90 percent of students entering American Samoa Community College (ASCC) enrolled in some form of remedial education to help prepare them for college-level courses (ASCC Report, 2014; ASCC Report, 2016). By comparison, the enrollment rate in remedial education at community colleges across the United States is about 60 to 70 percent (Bailey, 2009; Radford, Pearson, Ho, Chambers, & Ferlazzo, 2012). These troubling statistics indicate the prevalence of academically underprepared students at community colleges, both in American Samoa and across the nation. A recent study examining the college pathways of remediated students in Northern Marianas College revealed that remediated students consistently fall behind their peers (who enrolled directly in college-level courses) on several measures, including persistence, cumulative grade point average, credit accrual and, most importantly, earning a college degree (Herman, Scanlan & Carreon, 2017). Not only do remedial students fall behind their peers who are enrolled in college-level courses, but students who eventually complete their remedial coursework are still at risk of not finishing college (Bailey, Jeong & Cho, 2010). Thus, enrollment in remedial education drains students of their resources and pushes their hopes of obtaining a college degree further away.

To address the high and persistent enrollment rate in remedial education in American Samoa, Governor Lolo Moliga signed an executive order on January 10, 2017 creating a seven-member task force with the charge to provide:

> recommendations pertaining to the future of public education in American Samoa, as the administration remains concerned with public high school graduates having to take

> remedial courses at the American Samoa Community College, before being able to continue with higher education courses (Sagapolutele, 2017, p. 1).

The creation of this task force to address educational issues in American Samoa not only indicates the priority that local leaders are placing on improving student outcomes, but also demonstrates the difficulty of identifying the reasons why students are academically underprepared for college. Thus, this study offers empirical support to this effort by examining both student- and teacher-level factors that contribute to college readiness and success in American Samoa.

College Readiness in American Samoa

According to the National Forum on Education Statistics (2015), a student is college ready "when he or she has attained the knowledge, skills, and disposition needed to succeed in credit-bearing (non-remedial) postsecondary coursework" (p. 1). This broad definition is appealing because college readiness is more than just mastery of English and math content areas tested on a placement exam or the expected knowledge in college-level courses. The inclusion of student "skills and dispositions" aptly recognizes a growing body of research that argues for a more holistic approach to understanding college readiness (Conley, 2014; Mattern et al., 2014; Nagaoka et al., 2013). The proposed definition is also non-prescriptive, allowing educators the flexibility to define the essential knowledge, skills and dispositions students need to succeed in college, and what is appropriate to their local context. Growing research on the role of culture in human development suggests that culture plays an important role in the development of students' socio-emotional learning (Kanaʻiaupuni, Ledward & Malone, 2017).

The introduction of western education has opened unprecedented opportunities for American Samoans to compete in the global economy, but at the same time it has created challenges within the indigenous population. The behaviors, skills, and dispositions that are expected of students to succeed in a western educational setting are often at odds with the learning styles of many Samoan students (Thomas, 1981). As a result, learning to navigate the school culture as well as the Samoan way of life or fa'asamoa is an overwhelming challenge for many students. As Thomas (1981) aptly summarized, "The extent of the academic shortcomings is shown by the standardized test scores, which find the average Samoan student several grades behind his or her age-mates in the States. Shortcomings in social skills have been reflected in reports of social-adjustment difficulties Samoans suffered in the States" (p. 45).

Some have suggested that the curricula in many of the local educational institutions fail to equip students with the skillsets that are deemed important and necessary for success within their local context (Kamu, 1996). Although these external factors can have a significant impact on students' educational experiences, they do not diminish the important work that classroom teachers do to help make a difference in the lives of students they serve. High failure rates among Samoan students in the classroom may not be indicative of their intellectual abilities nor their capacities for learning.

One of the challenges of defining college readiness is underlined by the fact that it is impossible to know whether a recent high school graduate is ready for college until he or she has taken a college-level course. Our understanding of college readiness has been informed mostly by retrospective examinations of pre-college performance measures that are predictive of outcomes deemed critical to success in college. While using pre-college measures to predict the

likelihood of being ready for college has increased our understanding of this topic, there remains considerable variability that is unaccounted for in many of these predictive models (Stephan, Davis, Lindsay & Miller, 2015). As a result, many students are inaccurately identified as not being ready for college and are then placed in remedial courses when they could have succeeded in college-level courses (Scott-Clayton, 2012). Additionally, varying assessment benchmarks and indicators of college readiness across postsecondary institutions offer little confidence as to what type of skills and knowledge students need to be successful in college (Fields & Parsad, 2012).

Considering the myriad of potential factors that influence students' educational journeys, this study attempts to provide empirical evidence for one of the critical relationships in education – the relationship between students and their teachers. More specifically, this study aims to understand how student-level and teacher-level factors contribute to students' college readiness and success in American Samoa using multilevel logistic modeling.

CHAPTER 2

LITERATURE REVIEW

This section provides an overview of American Samoa's educational context and previous research on measures of college readiness. The overview of American Samoa's educational context includes an analysis of factors that may have a unique influence on students' educational journies using Bronfenbrenner's (1977) ecological theory of human development. Additionally, this section provides an overview of both the secondary and postsecondary educational context in American Samoa and introduces the measures of college readiness examined in this study.

Background

American Samoa is the only U.S. territory in the South Pacific, having been ceded to the US by a council of high chiefs with a unanimous agreement in 1900. Situated 2,600 miles southwest of Hawai‘i and about 7,000 miles west of Washington, D.C., American Samoa is comprised of five volcanic islands and two coral atolls, with a combined land area of 76 square miles, which is slightly larger than the District of Columbia. About two-thirds of the main island of Tutuila is sloped at 30 percent or more, leaving most of the population living in low-lying coastal areas. The capital of American Samoa is Pago Pago, located on Tutuila.

Located just south of the equator in the South Pacific Ocean, American Samoa maintains a tropical warm climate and a relatively dense humidity throughout the year, ranging from 40 to 60 percent during the dry season (April to October) and 70 to 90 percent during the wet season (November to March). American Samoa's location in the South Pacific Ocean renders the islands vulnerable to tropical cyclones that peak during the wet season.

According to the American Samoa Department of Commerce (2017), its total population is approximately 60,300 persons. Of American Samoa's 21,099 school-age students, approximately 25 percent are enrolled in secondary education. Nearly 20 percent of Samoan adults aged 25 and older have no high school diploma, and only 9.9 percent have a bachelor's degree or higher (U.S. Census, 2010).

As an unincorporated and unorganized territory of the U.S., some provisions and protections of the U.S. constitution do not apply in American Samoa. For example, American Samoans are not U.S. citizens; instead, they are U.S. nationals who are not eligible to vote for the U.S. president. American Samoa and its sister nation, the Independent State of Samoa (or, Samoa), share a linguistic and cultural heritage, but differ greatly in their government structures. American Samoa's government is patterned after the U.S. state governmental structure, where an elected governor and lieutenant governor make up the executive branch, while Samoa's political system of government is patterned after the British government, where the head of state, the prime minister and cabinet members make up the executive body.

Influences of Ecosystem on a student's Experiences and Outcomes

This section highlights American Samoa's political, economic, cultural and religious contexts and their potential influences on a student's educational experiences and outcomes. This section does not provide a comprehensive analysis of all potential contextual factors that influence a student's academic achievement in American Samoa but provides readers with an introductory overview of American Samoa's unique context. In the past, many educational improvement efforts have failed, in part, because of a lack of perspective on the myriad factors that influence a student's learning (Tyack & Cuban, 1995). Thus, this section provides a theoretical lens to

understanding factors that may have a unique bearing on educational reforms in American Samoa.

Drawing from Bronfenbrenner's (1977) ecological theory of human development, a student's educational experiences are theorized as being influenced by the interaction of systems that collectively make up their ecosystem. The ecological niche describes the context and the unique position that a student occupies and functions in relative to Bronfenbrenner's spheres of influence.

According to Bronfenbrenner, there are four nested spheres or systems of influence that make up a student's ecosystem: the macrosystem, exosystem, mesosystem, and microsystem (Figure 1) (Bronfenbrenner, 1977). The nested relationships among the four systems suggest that they are not mutually exclusive but that each system complements, magnifies or augments the others. For example, in a cross-country study examining the impact of educational inequality and economic development, Klasen (2002) found a strong correlation between gender inequality in initial education level and annual economic growth rate. More specifically, gender inequality in education "undermines economic growth directly by lowering average human capital and indirectly through its impact on investment and population growth" (p. 370). Although the study did not imply causality, the results demonstrate how, for example, individual educational attainment (microsystem) can have a significant effect on a nation's economic growth (macrosystem). As such, the analysis of the possible factors that influence a student's learning experiences in American Samoa takes into consideration the interdependency among these systems in Bronfenbrenner's theory.

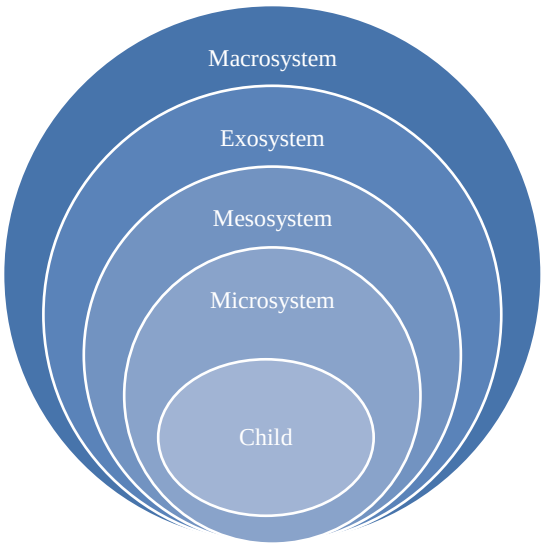


Figure 1. Bronfenbrenner's ecological framework.

Macrosystem

The furthest sphere of influence from the student is called the macrosystem. The macrosystem may include factors like cultural beliefs and values or national and economic systems, which can have significant impacts on a student's development. For example, a student's belief system and core values may be influenced by the culture in which he or she lives. A student who is raised in a communal island lifestyle may have a different belief system about the world compared to a student who was raised in an industrial urban environment. The macrosystems examined in this section include cultural, religious and political contexts. These macrosystems will be examined separately and considered according to Bronfenbrenner's ecological theory.

Cultural Context. A discussion of influences on American Samoa's youth would not be complete without emphasis on two concepts that underlie and distinguish Samoan culture: fa'asamoa and fa'alavelave.

Fa'asamoa. Fa'asamoa means "Samoan way of life." Children are taught from their youth the importance of honoring and maintaining family bonds through the practice of *fa'asamoa*. All members of the extended family, including children, are expected to partake in all family gatherings. This ingrained filial obligation serves as a reminder that the Samoan sense of self is connected to the family, village, and community. As such, the collective needs of the family come before the needs of the individual. Expressions of these sociocentric beliefs are manifested in how Samoans manage social relationships and goal orientations.

As an example of this manifestation, doing well in school is often motivated by the student's desire to appease his/her parents' expectations for excellence and to bring honor to the family. For example, in Ropeti's (2014) study, when asked what motivated him/her to do well in class at the American Samoa Community College, one Samoan student said, "…the first thing that came to my mind was, I don't wanna go back to school. But then I think of my parents, and how they're struggling right now with me, it motivates me to do my best, and I'm the older one. So, I should do my best and set an example for my younger brothers, so that's why I'm back in school" (p. 81). Another student explained, "My father and mother motivated me, they wanted me to come back here and finish my education." (p. 81).

For many Samoan youth, personal successes are less about the self. They are weighed primarily by their social value and significance to others, which may include parents and family members. Seeing parents' and family members' delight over one's accomplishment induces a

profound sense of gratitude and satisfaction for the individual--gratitude for the opportunity to reciprocate the family's constant support which culminated in the accomplishment, and satisfaction of knowing that the accomplishment has brought honor and joy to the family. Thus, recognizing the value and importance of meeting a parent's highest expectations reinforces Samoans' sociocentric goal orientations for success.

*Fa'alavelave***.** Filial obligations are also demonstrated through participation in a Samoan *fa'alavelave*, a formal traditional event that usually involves gift exchanges between two or more parties in the Samoan culture. A *fa'alavelave* includes, for example, weddings, funerals or the bestowal of a matai title where participants are expected to contribute either through monetary offerings, providing services in person (*fe'au)*, or customary gifts like fine mats and food. The literal meaning of the word *fa'alavelave* is "to make entangled" as one would be entangled in a net or in a social relationship (Mageo, 1990, p. 414). However, the colloquial meaning of the term is more closely associated with the notion of "burden" (Tapaleao, 2009, p. 13) or "interruption" (Tui Atua, 2009, p. 5).

One possible reason why *fa'alavelave* carries such burden-laden sentiment is that *fa'alavelave* contributions, either through one's own generosity or what is expected from the matai (or high chief), sometime exceed what an individual or family can afford. Nevertheless, contributing to a *fa'alavelave* is an opportunity for Samoans to show support and demonstrate their devotion to the extended family and community. For some, the desire to contribute to a *fa'alavelave* is almost like an irrepressible yearning to maintain and strengthen kinship, so families and individuals willingly give of their resources despite their destitute conditions.

As members of the local community, educational administrators and teachers in American Samoa are not exempted from their own social obligations to *fa'alavelave*. The inevitable call to render aid or service to a *fa'alavelave* can come even while school is in session and as a result, teachers are compelled to take time off from work, perhaps even exceeding their earned leave time, to fulfill these obligations.

*Religious context***.** *Fa'asamoa* and religion are inextricably connected and are critical to the lives of Samoans because they inform how Samoans carry themselves, especially in unfamiliar settings. As Samoan youths continue to learn the behaviors expected of them in a western educational setting, their approach to learning may be informed primarily by their experiences in the culture and at church.

In 2017, the Independent State of Samoa unanimously passed a bill declaring Samoa a Christian state (Feagaimaali'i-Luamanu, 2017). Although passing the bill was not without controversy, the bill is a testament to the importance of Christian tenets to the lives of Samoans and the extent to which those tenets are harmonious with the values and practices of *fa'asamoa*. While the independent State of Samoa and American Samoa differ in government administration, they both share a unique cultural heritage that is rooted in both the *fa'asamoa* and Christianity. For example, Kamu (1996) drew parallels between the often-quoted Samoan proverb, "*O le ala i le pule o le tautua*" (translated: The path to leadership is service) and teachings of Jesus Christ in the New Testament of the Bible. Kamu explained that,

> To become the *pule* (*matai*), one must first be a good servant to his *aiga* (family) or to his community. This notion of being a good servant as a prerequisite to attaining the title has

been popularized by the church and the people alike. Jesus is often referred to in support of such expression in terms of service and obedience. (p. 131)

The leadership philosophy embedded in the *matai* system is predicated on the principles of "caring, selflessness, concern for everyone in the *aiga* and community, etc., just as Jesus portrayed them" (Kamu, 1996, p. 133). Christian beliefs not only complement the values and practices of the *fa'asamoa* but also infuse its philosophical underpinnings with a sense of reverence and piety.

Because religion and the *fa'asamoa* are inextricably intertwined, they collectively inform other areas of social interactions among Samoans. For example, Samoan youths' conceptions of education and their approaches to learning are, in part, informed by their experiences in church and village settings. Since teachers are perceived as authority figures in the classrooms, students adopt the same behavioral norms they would practice as if they were in a church setting. For instance, students expect the teacher to lecture just as they would expect the pastor to sermonize from the pulpit (Purcell, 2007). Class discussions or sharing ideas in pairs are uncharacteristic of the kinds of learning activities Samoan youths are used to in church or village settings, which possibly explains why they may seem disengaged and uninterested in school. students understand that they are supposed to pay attention, whether intently or feigned, and not question the teacher, just as they would not dare interrupt the pastor's sermon or a chief's instruction. In short, the behavioral norms that a student is accustomed to in churches and village settings are likely to inform his or her conceptions about education and approaches to learning.

Even simple learning strategies like rote memorization are rooted deeply in both religious and cultural activities. For example, during the Samoan festival of White Sunday, youth are

expected to memorize and recite biblical verses called *tauloto* in front of the church congregation. Although *tauloto* is considered by many Samoan families as a routine performance, it is generally an acceptable approach to learning to read the Bible (Tagoilelagi, 1995). Dickie and MacDonald (2011) explained that rote memorization and oral presentation through *tauloto* were common learning strategies in church settings and that such learning preferences may be necessary for the maintenance of the Samoan culture and language.

The practice of *tauloto* is also a common learning approach in many classrooms in American Samoa, where students are expected to retain a relatively large quantity of information by committing to memory every single piece of data either from a text or lecture. As an example, the author could recall his early experiences of learning the multiplication tables in American Samoa, where a heavy emphasis was placed on memorizing numbers and their sequential order, and less so on understanding the relational comparisons between numbers.

Because the Samoan culture has been historically reliant upon oral or spoken tradition, sustained attention and verbal memory are valued and desirable skills among Samoans. Having a strong command of verbal memory may have helped facilitate important social functions in the Samoan culture. Duranti and Ochs (1986) observed in their anthropological study in Samoa how youths are expected to memorize a lengthy message to relay to another person. Children as young as four often acted as couriers and "are expected to notice activities of others and report on it to others" (p. 221). The oral heritage of the Samoan culture and the pedagogical approaches to learning in various social settings like churches and villages may predispose Samoan youths to prefer rote learning as the primary method for acquiring and retaining new knowledge.

National Political System. Unlike other U.S. territories like Guam, Puerto Rico, the U.S. Virgin Islands and Northern Mariana Islands, American Samoa is the only U.S. territory where people who are born there are called U.S. nationals, not U.S. citizens, and the U.S. constitution is selectively applied. The 1900 Deeds of Cession, which ceded American Samoa to the U.S., was predicated on several premises that enabled the Samoan people to maintain land ownership and the matai system. As an example, American Samoa did not adopt Article I, section 9 of the U.S. constitution, which forbids any person from holding titles of nobility. American Samoan maintains ownership of its communal land and titles of nobility (Aga, 2001).

Though this presents certain challenges, it has concomitantly facilitated American Samoa's ability to maintain its cultural distinctiveness and preserve the Samoan way of life, or *fa'asamoa*. This interesting tension is acknowledged in a 2015 U.S. court of appeals decision that struck down a petition filed by Leneoti Fiafia Tuaua and seven others (*Tuaua v. US, 2015*), who argued that people born in American Samoa should be considered U.S. citizens. Judge Janice Rogers Brown wrote on behalf of a three-judge panel that,

> Despite American Samoa's lengthy relationship with the U.S., the American Samoan people have not formed a collective consensus in favor of U.S. citizenship. In part this reluctance stems from unique kinship practices and social structures inherent to the traditional Samoan way of life, including those related to the Samoan system of communal land ownership. Traditionally aiga (extended families) "communally own virtually all Samoan land, [and] the matais [chiefs] have authority over which family members work what family land and where the nuclear families within the extended family will live" (*King*, 520 F.2d at 1159). Extended families under the authority of

> matais remain a fundamentally important social unit in modern Samoan society. Representatives of the American Samoan people have long expressed concern that the extension of U.S. citizenship to the territory could potentially undermine these aspects of the Samoan way of life. (p. 131)

While the prospect of receiving U.S. citizenship is welcomed by many American Samoans, especially those serving in the U.S. armed forces, local leaders understand that the uniform application of the U.S. constitution in American Samoa would ultimately lead to the loss of the Samoan way of life, or *fa'asamoa*. The *matai* (chief) is a title of nobility in the Samoan culture that is conferred unanimously to an individual by the *aiga potopoto* (family as a whole). The matai carries the heavy responsibility of administering to the needs of the family, and in return, family members are expected to respect and fulfill any assigned tasks from the matai. Respect and deference towards elders, and especially those holding the esteemed title of the matai, are among the fundamental values and practices of *fa'asamoa*. As Aga (2001) pointed out, "Samoans hold that if the fundamental values and practices of fa'asamoa are not adhered to or effectively adapted to meet today's needs, the family will be put at great risk. This vulnerability exposes the family to the threat of fragmentation" (p. 4). Since the family unit is essential to the social organization of the Samoan culture, abandoning these fundamental values and practices would also lead to the disintegration of the matai system. Faithful adherence to cultural values and practices are necessary to ensure the maintenance and vitality of the *fa'asamoa*.

American Samoa's unique political status with the U.S. has allowed Samoans to maintain their cultural identity; however, managing conflicting expectations for success between the *fa'asamoa* and the United States is becoming a greater challenge. For example, many families in

American Samoa are struggling to balance the economic needs of the core family while fulfilling their social obligations to provide resources for cultural events like *fa'alavelave*. In many cases, families choose the latter despite their poor economic situations, which further drains them of limited resources that could be used elsewhere. Recognizing the impact of *fa'alavelave* on American Samoa's future generations, the Department of Commerce director, Kenisili Lafaele, proposed that "there should be some territorial policy to encourage families to control cultural spending to a reasonable level and place more of their limited incomes to education/trade schools, health care, and healthy living" (Sagapolutele, 2017). The irony is of living in a place of tropical abundance with a strong culture of people helping one another while many are living in hardship demonstrates the difficulty of meeting cultural expectations in a western system of economy.

To summarize, American Samoa's unique relationship with the U.S. as an unincorporated territory has fostered a growing demand for families to learn and conform to cultural, social and professional expectations of both the sovereign nation and the *fa'asamoa*. The impact of this macro-level influence can be seen in situations where families use resources that could help further their children's educations to fulfill their social obligations to *fa'alavelave*. These resources that are not spent on children's education are lost opportunities that could enrich children's learning experiences.

Exosystem

Bronfenbrenner's model aptly illustrates that the macrosystem provides the foundation upon which other spheres of influence rest. If the foundation of a home is its macrosystem, the exosystem is the framing of the house. The exosystem in Bronfenbrenner's model describes the indirect influences on a student's development, where the student is not an active participant.

The exosystem sphere of influence may include the indirect influence that a parent's occupation has on a student. For example, a father's occupation as a farmer might influence his child's preferences for certain foods that are grown and harvested at the farm. Additionally, the extent to which a father's occupation helps to provide basic resources to help meet the child's educational needs can have a strong influence on the child's educational experiences. The exosystem can also indirectly affect a child's learning where, for example, cultural participation is given precedence and education is relegated to a lower priority. As an example, parents' expectations for their children to participate in *fa'alavelave* can have negative consequences on their children's education. A school-age youth who participates in a *fa'alavelave* during the evening may feel overwhelmed and physically drained; due to this mental and physical stress, they may then perform poorly in school the next day. In some cases, a child will miss school altogether to fulfill his or her social obligations of *fa'alavelave*.

Local leaders in American Samoa have expressed their concerns about the impact of *fa'alavelave* on youth, especially given the low economic status of many families in the territory. In his 2016 cabinet meeting address, Governor Lolo Moliga called on local traditional leaders to help mitigate the demands of cultural contributions through *fa'alavelave* by proposing a solution that would "ensure families are happy and youth are involved in the Samoan culture" (Samoa News, 2016). Kenisili, Director of American Samoa Department of Commerce, explained that the unregulated cultural contributions expected from many local families are making matters worse by driving families into greater poverty and that this "pattern of spending is a contributing factor to the general health status and scholastic/vocational aptitude of our young people — the future of American Samoa" (Sagapolutele, 2013). These expressed concerns from local leaders perhaps indicate that changes may be on the horizon in American Samoa to help alleviate the

pressure and demands for families to contribute to *fa'alavalave*. Although it is not clear how future policies will affect family contributions to *fa'alavelave*, local leaders have suggested that *fa'alavelave* contributions are vital to *fa'asamoa* and should not be abolished. As such, balancing the economic needs of local families without compromising the spirit of giving to a *fa'alavelave* may perhaps be the biggest challenge that local leaders need to address.

Minimum wages in American Samoa are set by industry type. As a result, there are 18 different minimum wages ranging from $4.90 in the hotel industry to $5.99 for a stevedore, lighterage, and other maritime shipping agency activities within the shipping and transportation industry. The minimum wage for government employees is $4.81 per hour. In 2010, the median household income in American Samoa was $23,892, which was only 47 percent of the median household income in the US. More than half (57.8 percent) of people in American Samoa were below the poverty level. This is in sharp contrast to the U.S. national average of 15.3 percent. Additionally, although American Samoa's 2010 unemployment rate was 9.9 percent, local leaders reported the most recent unemployment rate at 14.3 percent (Samoa News, 2017).

Although studies have shown a significant relationship between poverty and student academic performance in school (Sirin, 2005; Sheridan & McLaughlin, 2016), it is not clear how these socioeconomic measures function within a communal island lifestyle. However, the fact that more than half of the people in American Samoa live in poverty (U.S. Census, 2010) perhaps indicates that some resources may be lacking to help support children's learning. Further, the stress of poverty is compounded by the demands on families to fulfill social obligations to *fa'alavelave*. Not only are these demands a burden on the head of the household,

but they are also becoming an encumbrance and a source of stress for many Samoan youth (Ofahengaue Vakalahi & Godinet, 2008; Hang & Bell, 2015). As one Samoan youth lamented,

> Too much money is given all the time, and in a way, they are just giving money away, you know what I mean? Every time we have to give, my parents would give more. And sometimes my parents don't think about how it is going to affect us, when they give and next time they are going say oh, we should have kept some money for us. They are sometimes too generous. (Vakalahi & Godinet, 2008, p. 239)

In cases where expectations between *fa'asamoa* and western education collide, cultural obligations trump school commitments. Carmichael (2007) observed that the competition between U.S. and Samoan values could have a detrimental effect on a student's education. For instance, choosing to fulfill an obligation to participate in a cultural event versus the opportunity to attend a territorial-wide speech competition is a common dilemma faced by many youth who live in a world with competing cultural paradigms. In these cases, many Samoan youths choose to fulfill their social responsibilities and miss out on precious educational opportunities.

Ofahengaue Vakalahi and Godinet (2015) proposed two possible reasons why *fa'alavelave* has become a negative experience and a source of stress for some youths in American Samoa. First, there is a tendency for Samoan families to overcompensate when it comes to contributing to *fa'alavelave*. For example, in addition to contributing their limited resources, family members, especially youths, are expected to give of their time to perform *feaus* (chores) and tend to the needs of those in charge at *fa'alavelave.* As a result, many youths feel burned-out and overwhelmed by these demands being placed upon them. Second, the collision of values between the requirements of the traditional *fa'asamoa* and the new American culture of

individualism and convenience has been reported as a source of conflict (Ofahengaue Vakalahi & Godinet, 2015).

Teachers who are informed of the importance of Samoan traditional requirements have also expressed their concern about the impact of Samoan *fa'alavelave* on a student's education. For example, one teacher explained that,

> Because in the Samoan culture the students most of their time they are exposed to a lot of culture-based *fa'alavelaves* [family obligation] and other things happening at home. So, they will be, they have an exam or something that, the first priority goes to doing things with their family so then … if they come and write the exam after for example a funeral of some relative or close family member. I don't think they'll be in a good mental state to, to take up the assessment. (Hang & Bell, 2015, p. 772)

Just as students are impacted by the responsibilities of traditional obligations, teachers and school administrators may also have to make the difficult decision of missing school to fulfill their own social obligations to *fa'alavelave,* further affecting student outcomes. As research demonstrates, teacher absenteeism can have a negative impact on student outcomes in school (Harris van Keuren, 2009; Black, Seder, & Kekahio, 2014). A study by the Pacific Region Educational Laboratory (1995) revealed that students in the Pacific region are at risk for school failure when teachers are chronically absent from the classroom. Although the causes of teacher's chronic absenteeism in the Pacific region are not clear, one study suggests that social and cultural norms may be part of the reason that teachers take time off from work (Pacific Resources for Education and Learning, 1998).

As Uehara (1999) discussed, whenever there is a cultural event or *fa'alavelave* in the village, a teacher's participation in the cultural event takes precedence over school responsibilities. As a result, a school principal from the same village as the teacher may be reluctant to penalize teachers for missing school because "maintaining good relationships is more important than enforcing policy" (p. 9). When teachers do not show up at school, however, the students suffer. As Hezel (1999) explained, one of the challenges of fitting a western educational system into a communal island lifestyle is the difficulty of accommodating opposing values (Hezel, 1999).

In short, the interactions among low economic status, social obligations and high teacher absenteeism in American Samoa offer some insight into some of the factors that may indirectly influence a student's performance in school. While these factors may be outside of the student's control, their influences are critical to the student's success in school.

Mesosystem

The mesosystem describes the interactions between microsystems and how these interactions influence student's educational experiences and development. The mesosystem's influence can be observed, for example, through the interaction of a student's parent (microsystem #1) with his or her teachers (microsystem #2), where both parents and teachers contribute to a student's physical, emotional and intellectual development. The mesosystem can also be extended to other spheres of influence where the student is an active participant, such as church, sports or other local organizations. Collectively, these influences help shape the student's learning and development.

At home and church, a Samoan youth is expected to live by the *fa'asamoa*. At school, other behavioral expectations for success, which may conflict with the *fa'asamoa,* take precedence. For example, asking questions in class may be considered disrespectful or in some cases may be scorned by the community of learners, because questioning is perceived as deviating from cultural norms of interacting with an authority figure (the teacher). Even if teachers encourage a student to ask questions, the student may shy away from such invitation to avoid the social stigma of questioning authority.

Another example is the potential influence of the Samoan culture on teachers' preferred methods of instructions. Purcell (2007) explained that "in Church, the pastor lectures from the pulpit. In the village, the chiefs lecture when there are meetings. In the home, the parents instruct their children through the lecture. And so, in school, it becomes almost necessary for teachers to lecture to the students" (p. 79). Purcell argued that teachers' instructional preferences are informed by their experiences in the church, home and village settings, where authority figures in each of these settings use lecture as the primary mode of instruction. As a result, students also expect teachers to lecture when they come to the classroom.

In addition, *fa'asamoa* has informed students' approaches to learning in school, and the oral heritage of Samoan culture may equip Samoan children with valuable learning skills. The practice of *tauloto* in the traditional Samoan White Sunday festivity is a learning strategy that Samoan students are already equipped with when coming into the classroom. *Tauloto* is considered an important practice for maintaining the Samoan language and culture, and may also help Samoan students strengthen their capacity for rote learning. For instance, many Samoan students learned to transfer this learning strategy of rote memorization to their learning in school.

Microsystem

The microsystem is the most proximal sphere of influence to the student. Interactions between the student and the parents, for example, provide the most direct influence on a student's learning and development. The student not only learns about parents' expectations and how to meet them, but the parents learn how to respond to the student's needs. This reciprocal learning process is a key element of the microsystem.

Direct interactions with parents, church leaders, peers and school teachers represent the microsystem level of influence in Bronfenbrenner's model. Collectively, each microsystem contributes to a student's development through a reciprocal learning process. Just as a student forms new learning experiences from interactions with parents, siblings, church ministers and school teachers, these individual participants also form new learning experiences as they learn how to respond to the student. This reciprocal learning process reinforces core beliefs and values that are important for success in both a western educational setting and *fa'asamoa*.

As described earlier, the microsystem can also be influenced by activities at the macro-level or from the macrosystem. For example, weak economic activity at the national level can have a significant influence on poverty at the individual level. Thus, a student's educational experiences in American Samoa at the micro-level or microsystem are also reflections of the meso-, exo-, and macrosystem influences that are more distal from the student.

In sum, macro-level factors like the *fa'asamoa,* religion and American Samoa's political status can potentially influence a student's individual educational experiences. For example, because *fa'asamoa* dictates the values, beliefs and behavioral norms among Samoans, abiding by these principles is critical to maintaining one's identity as a Samoan. Unfortunately, faithful

adherence to these principles can be challenging for many Samoan students who are immersed in an educational system that is based on western values.

The indirect influence of family poverty on a student's educational achievement shows the exosystem's influence on a student's educational experience in American Samoa. Moreover, the effects of social obligations through *fa'alavelave* can indirectly affect a student's education. For example, students who participate in *fa'alavelave*, either by choice or family expectations, miss out on opportunities to learn new materials in school. As a result, they may perform poorly in their classes. Teachers' participation in *fa'alavelave* also impacts their students' outcomes. When teachers are absent from school to fulfill their social obligations to a *fa'alavelave*, it becomes another lost opportunity for the students to learn.

The interactions between home, church and other local settings offer some perspective of the mesosystem's influence on student's educational experiences in American Samoa. For example, rote memorization as a strategy for learning materials in school is reinforced in church rituals through the practice of *tauloto.* Moreover, Samoan students' perceptions of classroom learning are informed by their experiences in church, home and in the village. Parents lecture in the home, ministers lecture at church, and chiefs lecture in the village, and so, for many Samoan students, it is natural to expect teachers to lecture in the classroom.

The microsystem explains the most proximal and direct influences on a student's learning experiences in American Samoa. Values and beliefs are reinforced through a student's interactions with parents, teachers, ministers, peers and others. Through the microsystem, a student learns through rewards and other reinforcement mechanisms that certain actions, like doing *fe'au* at a *fa'alavelave*, are valued and are the appropriate course of action when needed.

Parents and teachers, for example, also learn how to interact with the student by rewarding desirable behaviors and providing punishments for undesirable behaviors. In short, the microsystem's influences on a student's learning experiences in American Samoa can be seen in the reciprocal learning process between the student and other participants.

College Readiness in the Pacific Region

This section focuses on college readiness in the Pacific region, and looks specifically at American Samoa, Guam and the Commonwealth of the Northern Mariana Islands (CNMI). Each of these Pacific island jurisdictions has only one community college (American Samoa Community College, Guam Community College, and Northern Marianas College). In addition, all three island nations are territories of the United States and thus have access to federal resources to sustain institutional operations.

Most students in the Pacific region are entering local community colleges academically unprepared for college-level coursework. For instance, more than 96 percent of incoming first-time students at the American Samoa Community College (ASCC) were enrolled in remedial English courses in the 2016 Fall semester (ASCC Annual Report, 2016). Although this was the highest remedial enrollment rate ASCC had seen in recent years, the average English remedial enrollment rate since 2010 remained virtually the same at 94 percent. Similarly, of the same 277 entering freshmen in the 2016 Fall semester at ASCC, over 98 percent were placed in remedial math, a rate which has remained unchanged since 2010.

Guam Community College (GCC) and Northern Marianas College (NMC) have also experienced a high percentage of incoming first-time students in need of remedial education (Guam Community College Fact Book, 2017). In 2016, approximately 96 percent of GCC

students who took the COMPASS placement exam placed in remedial math. Similar to ASCC, the average enrollment rate of incoming first-time students in remedial math courses at GCC for the past ten years averaged at about 96 percent. English enrollment rates at GCC, however, were more optimistic; for the 2016 school year, 65 percent of incoming first-time students who took the COMPASS placed in remedial English courses - the lowest since 2007.

In the Commonwealth of the Northern Mariana Islands, more than 90 percent of incoming first-time freshmen at the Northern Marianas College were placed in remedial math and 80 percent were placed in remedial English between 2010 and 2014 (Herman, Scanlan & Carreon, 2017). A recent study by Herman, Scanlan and Carreon (2017) compared the academic outcomes of students who initially enrolled in credit-bearing courses and students who initially enrolled in remedial courses at Northern Marianas College. Figure 2 summarizes some of the outcomes examined in the study which compared the college pathways of students who initially enrolled in credit-bearing courses and remedial courses at NMC in both English and math content areas.

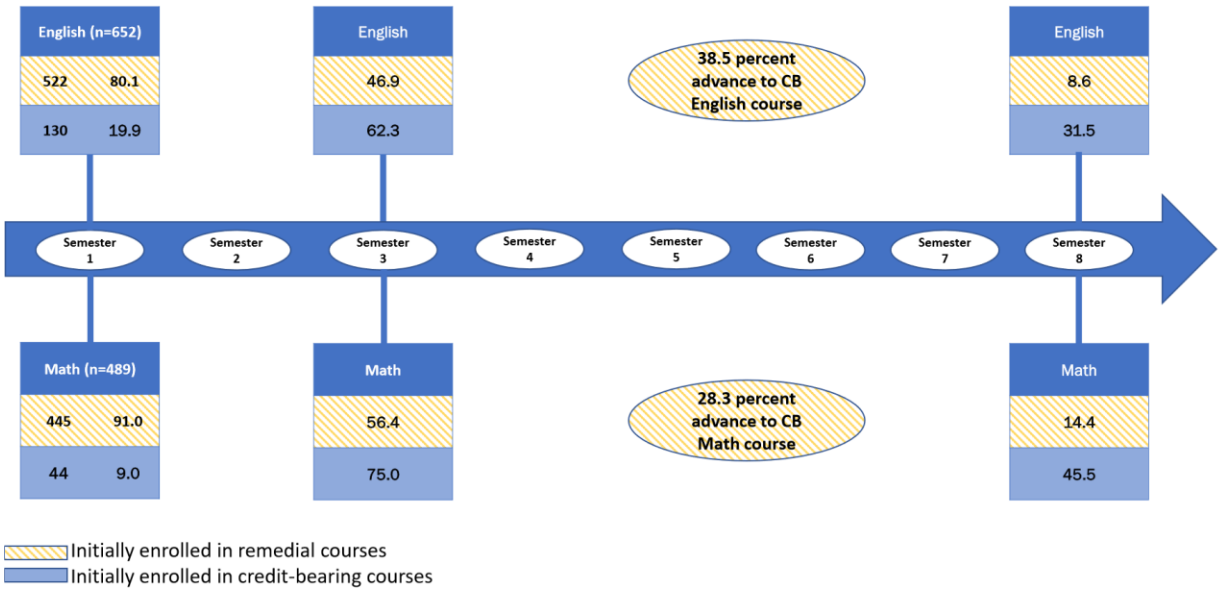


Figure 2. Comparing the college pathways of students who initially enrolled in remedial courses and those in credit-bearing courses and Northern Marianas College.

Of the 522 first-time, full-time freshmen who initially enrolled in remedial English courses, approximately 38.5 percent advanced to their first credit-bearing English course within eight semesters. Of the 445 first-time, full time freshmen who initially enrolled in remedial math, 28.3 percent advanced to their first credit-bearing math course within eight semesters. Moreover, only 8.6 and 14.4 percent of students who initially enrolled in remedial English and math, respectively, graduated from Northern Marianas College within eight semesters. Results from Herman et al.'s (2017) study suggests that students who initially enrolled in remedial courses at NMC were less likely catch up and succeed in college compared to their peers who initially started in credit-bearing.

High remediation rates in American Samoa, Guam, and CNMI warrant further investigation regarding the extent to which K-12 standards and expectations are preparing

students for post-secondary education, especially in American Samoa and CNMI, where only one postsecondary institution exists locally.

Structure of the remedial program

The remediation programs at some of the local colleges in the Pacific offer little incentive for students to advance to college-level courses. At Guam Community College, there are four levels of remedial English and three levels of remedial math that make up the remedial sequence in the English and math content areas, respectively. The remediation program at Northern Mariana College includes 11 remedial courses for the English content area, although only seven of those remedial courses are required to advance to college-level English depending on which remedial course levels in which students are placed. The remedial sequence for the math content area at Northern Marianas College identified three remedial math courses. The College Accelerated Preparatory Program (CAPP) at American Samoa Community College listed six remedial English courses for the English content area and only two remedial courses in the math content area (ASCC General Catalog, 2016).

The depth and breadth of the remedial programs at these colleges are indicative of the challenges many community colleges face when addressing college readiness in the Pacific region. Northern Marianas College's remedial coursework for English content is organized into three sub-contents, which include Listening/Speaking, Reading, and Writing. Each sub-content is composed of four remedial courses, with the Reading and Writing sub-contents sharing a foundational course. Students who are placed in the Listening/Speaking remedial sub-content and have completed the course sequence in the Reading and Writing remedial sub-contents are eligible to take college-level English. The English remedial course sequence at NMC reveals not

only the range of English proficiency skills that new incoming students are lacking, but also the extent to which those English proficiency skills are far below college-level expectations.

The diversity of the student body at NMC might perhaps offer insights into why some of these remedial programs have multiple levels and sub-content focus areas. For example, approximately 39 percent of entering first-time freshmen seeking an associate degree at NMC between the 2010 and 2014 school year were Chamorro (indigenous people of Guam) (Herman, Scanlan & Carreon, 2017). Filipinos made up about 35 percent of this student body, and the remaining 26 percent was composed of 11 different ethnic groups. The diversity of the incoming student body concomitantly brought a wide range of knowledge, skills, and dispositions, which impacted many aspects of the college's operations, including placement policies. Although the current remedial English sequence aims at addressing a wide range of academic English knowledge and skills, each level within the English remedial sequence also unfortunately opens up multiple exit points for students to leave the remedial program, if not college altogether. For example, while passing the lowest remedial course may indicate progress, mustering the effort and fortitude to attempt two more remedial courses and persist to their first college-level course can be discouraging for some students. As Bailey, Jeong and Cho (2010) discussed, about one third of remedial students who completed their remedial course sequence in the U.S. did not enroll in subsequent college-level courses. The authors suggested that failure to enroll in subsequent courses was a greater barrier to degree completion than failing or withdrawing from a course. It is possible that the longer students remain in remedial education, the more likely they are to leave college.

Availability of data for placement decisions

Another issue of addressing college readiness in the Pacific region is the availability and quality of data to inform student placement decisions. Current placement practices at ASCC, GCC, and NMC identify students in need of remedial education using cut scores on placement exams or other nationally recognized college entrance exams like the SAT, ACT or TOEFL (for English). Other information like AP courses, high school grade-point averages and grades in specific courses are also used for placement decisions.

In American Samoa, placement decisions at ASCC are determined based on students' scores on the SAT, ACT or TOEFL. Students who do not have scores on any of these tests are required to take ASCC's placement assessment. It is not clear what cut scores are used for placement decisions, nor the validity of those cut scores in relation to students' performance in entry college-level courses. At Northern Marianas College, the Accuplacer assessment is used for placement decisions in English, while the COMPASS assessment is used for placement decisions in math.

A recent study by Herman, Carreon, Scanlan and Dandapani (2017) identified five college readiness data points that are available in the American Samoa Department of Education that educational stakeholders may wish to consider when creating placement policies at the local college. These data points include high school grade-point average, high school graduation status, higher level math course, higher level math course grades and SAT-10 math and reading proficiencies. Herman et al. (2017) also reported six data points that are predictive of college readiness in the Public School Systems in the CNMI, which include AP courses, high school grade-point average, high school graduation, higher level math courses, higher level math course

grades, and SAT-10 math and reading proficiency. Although attendance and diploma data were available in both education systems, they were not included due to concerns about the quality and usefulness of these data points in predicting college readiness. The college readiness data points identified in the Herman et al. (2017) study were adopted from a college readiness profile used in the state of Hawai‘i (Hawai‘i P–20 Partnerships for Education, 2015). Although Hawai‘i and American Samoa are geographic neighbors, it is not clear how well these high school data points may predict college readiness within American Samoa's educational context due to local cultural distinctions and the availability of resources to support ongoing school improvement efforts.

In comparison to American Samoa and the CNMI, the placement policy at Guam Community College offers more flexibility for Guam Department of Education (GDOE) high school graduates to opt out of remedial courses if they meet a particular grade-point average and grade marks on certain high school courses. For example, GCC's Classroom Learning Yields Math & English Readiness (CLYMER) program gives students the option to enroll directly into the first college-level math course if they graduated from high school with a 3.2 cumulative grade-point average and completed Algebra 2 with a "B" grade or better. Additionally, students who graduated from high school with a 3.2 cumulative grade-point average and completed English 12 with a "B" or better can enroll directly in the first college-level English course. The implementation of the CLYMER placement policy at Guam Community College can serve as a case study for other Pacific jurisdictions that share similar college readiness indicators (high school grade-point average and grades in higher courses) and are interested in adopting similar policies.

Secondary education in American Samoa

There are ten high schools in American Samoa. Of these, six are public high schools under the jurisdiction of the American Samoa Department of Education (ASDOE). These schools include Leone high school, Manu'a high school, Tafuna high school, Samoana high school, Faga'itua high school, and Nu'uuli Vocational Technical high school. The combined average enrollment across all ASDOE public high schools within the last five years is 4,140 (ASDOE, 2017). Because of its remote geographic location outside of the main island of Tutuila, Manu'a high school enrolled a total of 55 students during the 2016-17 school year. Tafuna high school, on the other hand, had the highest enrollment of 1,230 students in the same year. Approximately 99 percent of the high school student composition during the 2016-17 school year were Pacific Islanders.

Within the last decade, both the federal and local government have invested considerable resources in the local education system (U.S. Department of Education, 2010; Sagapolutele, 2017). These investments can be easily seen in improvements in local school infrastructures, textbooks, and resources available in the classroom. Other enhancements include internet connectivity in classrooms and a robust educational data management system to track student data longitudinally.

Despite these educational investments, student performance on the Stanford Achievement Test Tenth Edition (SAT-10) has yet to show consistent improvements over the last ten years. The SAT-10 is usually administered to ASDOE high school seniors, and results are reported by four proficiency levels: Advanced, Proficient, Basic and Below Basic. More than 90 percent of high school seniors scored "Basic" or "Below Basic" on both the Reading and Math SAT-10

standardized tests across all six public high schools, from the 2008-09 school year to the 2014-15 school year (ASDOE, 2017).

In SAT-10 Reading, only 2 percent of high school seniors scored "Proficient" or "Advanced" in each school year between 2008-09 and 2014-15. In other words, 98 percent of high school seniors scored at "Basic" or "Below basic" in all seven of these school years. For SAT-10 math, the 2011-12 school year had the lowest percentage of high school seniors scoring at "Basic" or "Below basic" (93 percent). This was a six percentage-point decrease from the 2009-10 school year, where 99 percent of tested seniors scored at "Basic" or Below basic" on the SAT-10 math. If the SAT-10 performance trends among ASDOE high school seniors in the last decade offer an indication of college readiness in American Samoa, it is likely that many of these seniors will eventually find themselves in remedial education at ASCC (ASCC report, 2015; Burton & Ramist, 2001; Pearson Inc., 2011).

Remedial Program of American Samoa Community College

An examination of annual reports from ASCC since 2005 revealed several programs aimed at improving college readiness in American Samoa. Some of these programs include Upward Bound (ASCC Annual Report, 2004), Gear Up Samoa (ASCC Annual Report, 2007), and College Access Challenge (ASCC Annual Report, 2016). Another partnership initiative between ASCC and ASDOE includes offering English Language Institute (ELI) courses to high school juniors and seniors (Gurr, 2006). To help increase the success rates for students who are placed in remedial courses at ASCC, the English Language Institute was later converted to the current Center for the College Accelerated Preparatory Program (CAPP) (Browning, 2014).

According to the 2004 ASCC Annual Report, 58 percent of the 168 ASCC graduates during the 2003-04 school year spent anywhere from 1 to 3 semesters in remedial English. Even more surprising is the fact that 15 percent of this graduating cohort spent 4 to 6 semesters in remedial English – that is the equivalent of 2 to 3 years of enrolling in non-credit-bearing courses. Similar patterns were found for the math content for students who were initially referred to remedial math. Perhaps the more troubling numbers not captured in these statistics are for students who were initially referred to remedial education but never enrolled, and students who did not persist in the remedial education course sequence for various reasons.

At American Samoa Community College, high enrollment rates in remedial courses and subsequent high failure rates in those courses represent the myriad of challenges that local leaders are trying to address. For instance, 47 percent of remedial writing students and 41 percent of remedial reading students at ASCC during the 2009-10 school year did not pass their initial attempt in these remedial English courses (Ropeti, 2014). While placing in a remedial course may be considered an embarrassment for many students at ASCC, failing a remedial course can understandably quash any confidence in the prospect of attaining a degree. These challenges raise many questions as to why students are failing in remedial courses. Among other influential factors, part of the reason can be traced to the English language.

In American Samoa, public school systems are mandated by law to use English as the language of instruction (American Samoa Code Annotated, §16.0551). The law also specifies that the Samoan language may be used to facilitate teaching the English language. At ASCC, instructors are often compelled to use Samoan language in their instruction to be more responsive to students who struggle to converse, respond to inquiries or simply initiate discussions in English (Ropeti, 2014). When language barriers between instructors and students

are too overwhelming for students to overcome, many students are disengaged and "have been observed sleeping during instruction, leaving the classroom several times, talking with peers instead of doing class work, engaging in some other assignments, fidgeting and moving around instead of paying attention, and rarely volunteering to answer questions" (p. 32).

One of the common instructional practices for feedback in many Samoan schools is teachers routinely asking the entire class if they understood the materials. In return, all students in the classroom are expected to respond to the teacher in unison, "Malamalama fa'afetai" (translated "we understand, thank you"), and any class member who deviates from this chorus or reacts differently is teased and ridiculed by the community of learners. The thought of asking questions in class is almost immediately suppressed for fear of disrespect, which could bring shame not only to the individual but the family. "Since questions are almost never asked, the end result is always failure" (Ropeti, 2014).

High enrollment rates in remedial courses and subsequent failure in remedial courses at ASCC conceivably acted as the catalyst for reforming the remedial education program, resulting in the adoption of the current remedial program. ASCC's "Pathway to Success" framework (ASCC Factbook, 2016) identified six key indicators to help track students' progress once they enter the college (Figure 2). These key indicators are consistent with other widely used indicators of college readiness in the research literature and thus, will be considered in this study as dependent variables when modeling the data. More importantly, these indicators reflect important milestones in students' college experiences and areas that local leaders at ASCC value.

The "Pathway to Success" framework tracks students once they are placed in either a remedial or college-level course at ASCC (see Figure 2). Since most incoming students at ASCC are placed in remedial courses, the second indicator on the "Pathway to Success" framework

identifies the passing rate for the highest remedial course in both English and math. For students who are placed directly into college-level courses, earning a "C" grade or higher in an English or math gateway course constitutes the next milestone in their "Pathway to Success" at ASCC.

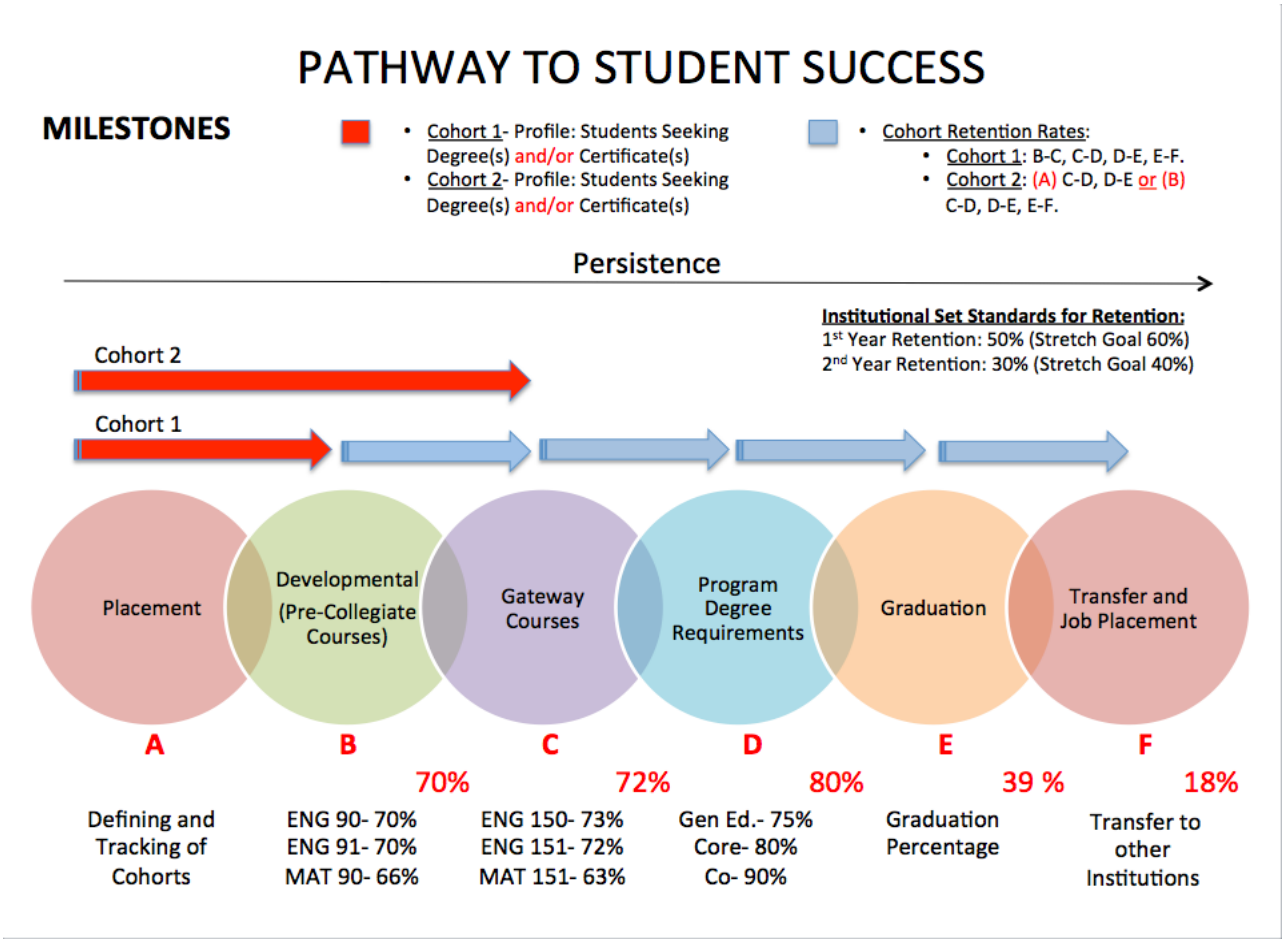


Figure 3. ASCC Pathway To Student Success Framework. Adapted from 2015-2016 Fact Book American Samoa Community College, Office of Institutional Effectiveness, 2017, American Samoa Community College, p. 2. Copyright by the American Samoa Community College.

The College Accelerated Preparatory Program (CAPP) at ASCC is intended to move students through the remedial education program more quickly, by allowing them to take two remedial courses within a single semester (ASCC Annual Report, 2015). The remedial courses

are compressed into six weeks, allowing students to take at least two remedial courses within the regular 16-week semester (ASCC Standard Operation Procedure Manual, 2015).

The CAPP at ASCC listed six remedial English courses for the English content area and two remedial courses in the math content area. The English content is split into two sub-contents – Reading and Writing. Table 1 shows the different remedial courses within the CAPP at ASCC.

Table 1

List of remedial courses offered at ASCC

Content area	Courses
English – Reading	ENG 70 Beginning Reading
	ENG 80 Intermediate Reading
	ENG 90 Advanced Reading
English - Writing	ENG 71 Beginning Writing
	ENG 81 Intermediate Writing
	ENG 91 Advanced Writing
Math	MAT 80 Preparatory math
	MAT 90 Elementary Algebra

Current placement practices at ASCC identify students in need of remedial education based on their scores on placement exams or other nationally recognized college entrance exams like the SAT, ACT or TOEFL. The CAPP policy outlined in the student handbook (ASCC, 2016) states that:

- A student with a placement result indicating ENG 150 Introductory to Literature, and ENG 151 Freshman Composition and Math 90 Elementary Algebra, is eligible to take General Education courses (150-college level) courses.
- The student must pass MAT 90, ENG 90, and ENG 91 in the first session of CAPP in order to continue with the recommended General Education courses in the CAPP second session.
- If the student does not pass MAT 90, ENG 90, and ENG 91 in the first session of CAPP, he/she will not be allowed to take 150 college-level courses in the CAPP second session until these courses are complete.
- Students placing in this category will be assisted with advising, registration, and progress monitored by the Academic Advisors.

Once students complete the CAPP, they are reclassified as "in-coming ASCC Freshmen college-level students" (p. 14). To matriculate into General Education (GenEd) courses, which are required before taking program coursework, students must first complete remedial courses and pass "gateway courses." These gateway courses include ENG 150, ENG 151 and Math 151 (ASCC Annual Report, 2015).

A growing body of evidence suggests that accelerated remedial programs lead to better student outcomes in college. In their examination of three accelerated programs in community colleges in Colorado, California and Maryland, Jaggars, Hodara, Cho, and Xu (2014) found that students who participated in accelerated remedial programs had significantly better outcomes compared to students who participated in traditional remedial programs. For example, across all three community colleges, accelerated remedial program participants outperformed traditional remedial program participants in gatekeeper course enrollment and completion. Although the

support services may be different across these accelerated remedial programs, the research offers strong support of the structural component and intent of the program – that is, to help students get through their remedial courses faster and move towards obtaining a college degree, while minimizing opportunities to drop out of college before completing their remedial course sequence (Bailey, 2009; Bailey, Jeong & Cho, 2010). While the accelerated remedial program at ASCC offers an accelerated path towards degree attainment, it is unclear whether the compressed timeline leads to better outcomes in the gateway courses.

Potential issues with the remedial program at ASCC

Although the current remedial education program compresses remedial courses into a relatively shorter timeframe, it still creates exit points for students to leave the program, which equates to leaving college altogether. For example, students who place in the lowest remedial English Reading/Writing and Math courses can exit the remedial program by their second semester, regardless of whether they pass. If students pass remedial ENG 70, ENG 71, ENG 80 and ENG 81 all within their first semester, they would still need to enroll in at least two more remedial English courses (ENG 90 and ENG 91) before advancing to college-level courses.

Additionally, if these same students are placed in the lowest level of remedial math, it will take at least two semesters before they can enroll in their first college-level courses. A national study examining the outcomes of students who were initially referred to remedial education found that failure to enroll in subsequent courses was a greater barrier to degree completion than failing or withdrawing from a course (Bailey, 2009; Bailey, Jeong & Cho, 2010). For instance, data from 130 community colleges in the U.S. revealed that about two thirds of remedial students who completed their remedial course sequence enrolled in subsequent gatekeeper courses. Of those who did enroll in the gatekeeper courses, about three quarters

passed those courses. It is possible that those sequence completers could have passed their gatekeeper course, but for some reason did not enroll.

Another challenge to the current remediation program in American Samoa is the extent to which the placement exam and gateway courses are aligned with the high school English and math curriculum. ASDOE high school seniors are required to complete Algebra 2 to graduate. Research has shown that high school students who passed Algebra 2 have better college outcomes (e.g., higher first-year college grade-point average, persistence to the second year, and higher college graduation rates) compared to students who did not pass Algebra 2 in high school (Gaertner, Kim, Desjardins & McClarty, 2013). With this in mind, if placement exams and gateway courses at ASCC are aligned with ASDOE high school math standards and expectations, it would be reasonable to expect a lower percentage of students in remedial math.

Measures of College Readiness

While the research literature is replete with varying measures of college readiness, this section focuses specifically on college readiness measures that were examined in this study. Researchers have distinguished between leading and lagging indicators of college readiness (Foley et al., 2008). Leading indicators are used formatively to understand whether students are making progress toward a specified goal, such as initial placement in college-level courses or first-year college grade-point average. Leading indicators might include enrollment in specific courses, such as Algebra 2 or AP English. Lagging indicators, on the other hand, indicate the culmination of an education process or outcome to which the leading indicators are aligned. The distinction between a leading and lagging indicator, though, is not always clear and depends on the context. A leading indicator in one analysis could be used as a lagging indicator in another. For example, initial enrollment in a remedial or college-level course may be considered a leading

indicator when the outcome of interest is earning a college degree. At the same time, initial enrollment in a remedial or college-level course can be a lagging indicator in relation to leading high school indicators of college readiness (e.g., earning a B grade or higher in Algebra 2, AP courses, dual enrollment, etc.).

Measures of College Readiness

High school Algebra 2 grades

Research has shown that students who passed Algebra 2 have higher first-year college grade point average, persist to the second year of college, and have higher college graduation rates compared to students who did not (Gaertner, Kim, Desjardins & McClarty, 2013). While it is possible that students who opt in to take Algebra 2 may be more prepared for college-level math compared to their peers who opt-out of the course, the study created an instrument variable to help mitigate the role of selection bias. Geartner et al., findings were consistent with a previous study by Rose and Betts (2001) where students who completed Algebra 2 courses were 12 percent more likely to earn a bachelor's degree compared to their peers who completed only Algebra or Geometry.

Other community colleges with similar contexts to American Samoa have also recognized the importance of high school Algebra 2 performances on college readiness. For example, the placement policy at Guam Community College (GCC) offers flexibility for Guam Department of Education (GDOE) high school graduates to opt out of remedial courses if they meet the required grade point average and grade marks on certain high school courses. For example, GCC's Classroom Learning Yields Math & English Readiness (CLYMER) program give students the option to enroll directly into the first college-level math course if they

graduated high school with a 3.2 cumulative grade point average and completed Algebra 2 with a "B" grade or better. Both empirical evidence and precedence demonstrate the importance of Algebra 2 course-taking to college readiness. As such, this study examined both students and teacher factors and their relationships to Algebra 2 outcomes.

High school English course

Unlike Algebra 2, identifying specific high school English courses that are related to college readiness is more challenging, in part, because of the varying standards and expectations for English courses between education districts. As such, examining the predictive utility of high school English courses may have stronger inferences when interpreted within the context of the population being studied. For example, the Virginia Department of Education conducted a multi-year effort to identify high school indicators that are associated with enrollment and successes in credit-bearing courses in 2- or 4-year Institutions of Higher Education (IHE) in Virginia (Jonas, Dougherty, Herrera, LaTurner, Garland, & Ware, 2012). Since the Virginia Department of Education sets their Standard of Learning (SOL) for each grade level the findings from the multi-year research efforts reported that student success in the Writing SOL was "strongly associated with whether they enrolled in credit-bearing, non-remedial English courses in college, and whether they earned a grade of C or better in their first college English course." (p. 6). It is not yet clear whether ASDOE high school English courses are preparing students for college-level English at the local American Samoa Community College. The current study seeks to provide preliminary findings to address this knowledge gap.

Guam Community College also used high school grades in English 12 for college placement decisions in English in the CLYMER placement policy. Students who graduated high

school with a 3.2 cumulative grade point average and completed English 12 with a "B" or better can enroll directly in the first college-level English course. The implementation of the CLYMER placement policy at Guam Community College offers unique precedence for exploring college readiness using high school grade point averages and grades in specific English and math courses.

Initial English and math course enrollment

Avoidance of remedial education is used widely in many studies as an indicator of college readiness (Bailey, 2009; Herman, Scanlan & Carreon, 2017; Radford, Pearson, Ho, Chambers, & Ferlazzo, 2012). Referral to remedial education indicates that students are academically "unready" for college-level coursework. The goal, then, of remedial education is to help students develop the knowledge and skills necessary to succeed in college-level courses. Students are assigned to remedial courses in different ways. The most common method of assignment for remedial English or math courses is based on placement exam scores. Students who opt not to take a placement exam may be automatically assigned to remediation in some institutions. In other cases, colleges may determine that a student would benefit from placement into remedial courses based on the student's high school coursework and performance on standardized exams in high school, such as the SAT/ACT (Parsad, Lewis, & Greene, 2003).

Earning a college degree

Earning a college degree is the aim of college preparation. Analyses from a nationally representative dataset on annual wages in the US from 1970 to 2013 revealed that college graduates with Bachelor degrees earned 56 percent more than high school graduates with no postsecondary degrees. Similarly, college graduates with associate degrees earned 21 percent

more than those with only a high school diploma (Abel and Deitz, 2014). In other words, college graduates with Bachelor degrees, on average, earn over $1 million more in their working lives compared to high school graduates. College graduates with associate degrees, on average, earn $325,000 more than high school graduates. The value of an education is not limited to financial wealth; earning a degree has also been shown to correlate strongly with, for example, better health, higher participation rate in the community and overall greater life satisfaction (Baum, Ma & Paea, 2013).

Predictors for College Readiness

Standardized tests

The SAT-10 exam is administered to high school students in the ASDOE in 9th and 11th grades. The exam developers (Pearson, Inc., 2011) have noted that 98.5 percent of SAT-10 Mathematics items and 100 percent of SAT-10 English Language Arts items align with Common Core State Standards (CCSS), which align with expectations for college and career readiness.

High school grade-point average (GPA)

Standardized tests, by their nature, are limited in content and format and may not fully capture a student's academic capabilities. Therefore, some researchers have used high school GPA in predicting college readiness, even though GPA reflects different grading standards among schools or across courses. High school GPA can be a reliable indicator of college readiness, particularly when considered in conjunction with college aptitude test scores (Atkinson & Geiser, 2009; Porter & Polikoff, 2012). In fact, in a review of college and career readiness measurements, Porter and Polikoff (2012) found high school GPA to be as good an indicator of college freshman GPA as standardized tests designed to predict college success. Although studies have found a relationship between high school GPA and college readiness,

these findings fail to identify a clear cut-point that most accurately predicts whether students will experience college success or not (Conley, 2011). Geiser and Santelices (2007) found that high school grade GPA was weakly correlated with several student economic characteristics which include parent's income and parent's education while standardized tests were strongly correlated with these measures. As a result, high school GPA was shown to have a less adverse impact on underrepresented student applicants who come from disadvantaged backgrounds.

High School coursework

The completion of rigorous high school courses is correlated with future college enrollment and success (Adelman, 2006; Atkinson & Geiser, 2009; Burton & Ramist, 2001; Porter & Polikoff, 2012). Studies have found that college readiness is linked to the successful completion of specific courses, including AP courses and higher-level math courses, such as pre-calculus, calculus, trigonometry, or statistics. For example, AP exam scores predict college grades and graduation rates (Ackerman, Kanfer, & Beier, 2013). Similarly, in a review of large data sets from high school graduating classes in 1982 and 1992, Adelman (2006) found that completion of at least one higher-level math course beyond algebra 2 – such as trigonometry, pre-calculus, or calculus – was associated with more than a two-times greater chance of students completing a bachelor's degree.

School attendance

School attendance matters. Allensworth and Easton (2007) examined the impact of high school freshmen absenteeism on school performances and found that, on average, students who missed more than two weeks of school were likely to flunk at least two classes. In fact, freshmen students who entered high school with high test scores and missed two weeks of school were more likely to fail a course compared to their peers who entered high school with low test scores

and missed just one week. Moreover, a study of public-school students in Rhode Island examined the impact of absenteeism on college enrollment and persistence and found that high school absenteeism was strongly associated with enrollment and persistence. For example, of the 408 students who missed school for at least 10 percent of the school year, 22 percent enrolled in college as full-time students in the fall semester immediately after their high school graduation. When researchers followed up on these students four years later, only 12 percent (50 students) were still enrolled full-time in college.

Teacher certification

Studies that have examined the relationship between teacher certification and student achievement have produced mixed results. One study found that students whose teachers were certified demonstrated greater achievement outcomes than students whose teachers were not certified (Darling-Hammond, Holtzman, Gatlin, & Heiling, 2005). Other studies however, have shown no statistically significant difference between student outcomes of certified and uncertified teachers (Goldhaber & Brewer, 2000; Fahmi, Maulana & Yusuf, 2011). Although these studies provide useful information for understanding teachers' influence on student outcomes, more context-specific research studies are required for the Pacific region regarding the utility of teacher certifications in improving student outcomes.

Teacher attendance

Teachers have the most school-based influence on students' academic outcomes (Miller, 2012). In a large-scale study examining teacher absenteeism across 56,837 schools in the US, 36 percent of teachers, on average, were absent more than 10 days during the 2009-10 school year. Teacher absenteeism carries both financial and nonfinancial costs. With 5.3 percent of teachers absent on any given day, the estimated financial cost in stipends for substitute teachers and

associated administrative tasks to maintain operations can amount to a minimum of $4 billion annually. Additionally, student mathematic achievement lowers for every 10 days teachers are absent (Miller, 2012). Thus, when teachers are not in the classroom, the student suffers.

Research Questions

The proposed study builds on previous research which identifies K-12 factors like standardized test scores, completion of rigorous high school coursework, grade-point averages and other behavioral factors like high school attendance to be associated with postsecondary success.

The specific research questions are as follow:

1. To what extent do students' Algebra 2 grades in high school vary as a function of both teacher-level (e.g., teaching certification, highest degree attained and teacher absenteeism rate) and student-level characteristics (e.g., high school grade-point average, SAT score, and student absenteeism rate)?
2. To what extent do students' English 12 grades vary as a function of both teacher-level (e.g., attendance, experience, teaching certification, highest degree attained and hours of professional development) and student-level characteristics (high school grade-point average, SAT score, highest English course completed, and absenteeism rate)?
3. To what extent do student's initial English course enrollment at ASCC vary as a function of both teacher-level (e.g., teaching certification, highest degree attained and teacher absenteeism rate) and student-level characteristics (high school grade-point average, SAT score, highest English course completed, and absenteeism rate)?

4. To what extent do student's initial math course enrollment at ASCC vary as a function of both teacher-level (e.g., teaching certification, highest degree attained and teacher absenteeism rate) and student-level characteristics (high school grade-point average, SAT score, highest math course completed, grade in Algebra 2, and absenteeism rate)?
5. To what extent does earning a college degree within three years of initial enrollment at ASCC vary as a function of teacher-level (teaching certification, highest degree attained and teacher absenteeism rate) and student-level characteristics (high school grade-point average, SAT-10 score, initial English and math course enrollment and absenteeism rate)?

CHAPTER 3

METHOD

The following section provides a description of the samples, variables and the data analysis strategy for the current study. Five distinct outcomes of college readiness and success were examined which include grades in high school Algebra 2 and English 12 courses, initial English and math course enrollment at American Samoa community college and earning a college degree. Except for English 12 course grades, these outcome measures have been studied extensively in the research literature as indicators of college readiness (see Literature Review section). Additionally, initial English and math course enrollment and graduation outcomes are aligned with outcome A and outcome E on ASCC's "Pathway to Success" framework, respectively (See Figure 1). Outcome A is initial course enrollment (which include both English and math courses) and Outcome E is graduation from ASCC.

Sample

Data for the current study were obtained from the American Samoa Department of Education (ASDOE) and includes student-level and teacher-level data from four public high school cohorts. Additionally, college data for high school graduates from the 2014 cohorts who enrolled at ASCC anytime during Summer 2014, Fall 2014 and Spring 2015 semesters were obtained from the American Samoa Community College. High school graduates from the 2014 cohort who enrolled at ASCC within a year were tracked for three years to gather data on their initial English and math course enrollment and college graduation data.

Teacher data were collected only for teachers who taught Algebra 2 and English 12 courses which included Praxis certification in Math and Writing, highest college degree earned

and attendance data. Teachers' attendance data were gathered only for the school year in which these teachers taught Algebra 2 and English 12 courses.

Student-level data

A total of 3,304 student-level records were received from the American Samoa Department of Education that included students who graduated from one of the six public high schools during the 2014, 2015, 2016 and 2017 school years. Additionally, a total of 268 student-level records were received from American Samoa Community College. The student-level records from ASCC included only ASDOE high school graduates from the 2014 cohort and who enrolled immediately at ASCC during Summer 2014, Fall 2014 or Spring 2015 semesters.

Teacher-level data

A total of 57 teacher-level records for high school English teachers and 31 teacher-level records for high school Algebra 2 teachers were received from the American Samoa Department of Education.

Dependent and Independent Variables

This section provides a description of both the dependent and independent variables that were examined in this study. More specifically, this section delineates the coding conventions and transformations for specific variables used in the multilevel regression analyses.

Dependent variables

Table 2

Dependent variables

Variable	Scale of measurement	Coding convention
High school English 12 course grade	Ordinal	2 = A± or B± 1 = C± 0 = D±, F or Incomplete
High school Algebra 2 course grade	Ordinal	2 = A± or B± 1 = C± 0 = D±, F or Incomplete
Initial English course enrollment	Ordinal	2 = English 151 1 = English 91 0 = Below English 91
Initial math course enrollment	Ordinal	2 = Math 151 1 = Math 90 0 = Math 80
Earned associate degree	Nominal	1 = Yes 0 = No

The five dependent variables examined in this study were high school Algebra 2 and "English 12" course grades, initial English and math course enrollment in college and earning a college degree. Grades in Algebra 2 and English 12 courses and initial English and math course enrollment were defined as college readiness outcomes while earning a college degree was defined as the outcome measure of college success (Table 2).

The dependent variables for research questions 1 and 2 were grades in Algebra 2 and English 12 courses, respectively. The grading scale at ASDOE follows the commonly used grading convention across the US of assigning letter grades to varying levels of achievement in a course. These letter grades include A+, A, A-,B+, B, B-, C+, C, C-, D+, D, D-, F, or I (Incomplete). Algebra 2 and English 12 course grades were recoded into three ordinal categories where D±, F or Incomplete grades were coded 0, C± grades were coded 1 and B±, A± grades

were coded 2 (Table 2). Coding Algebra 2 and English 12 course grades into three ordered categories were based primarily on their substantive meaningfulness (Jackman, 2000). For example, some of the common definitions assigned to letter grades are A±=Excellent; B±=Good or Above Average; C±=Satisfactory or Average; D±=Minimal Pass or Below Average; F=Fail and I=Incomplete. Thus, grouping students with A± and B± grades into one category represents "Above Average" performers, students with C± grades represents "Average" performers and students who earned D± grade or below represents "Below Average" performers. Additionally, categorizing the course grades into these three ordered outcomes perhaps offers a more specific and meaningful interpretation for the mulitlevel ordinal logistic regression results.

The American Samoa Department of Education does not require students to enroll in a specific English course to graduate so long as they earn a minimum of 4 credits in English (See appendix B for the list of English course offerings at ASDOE). Using "English 12" course grade as an outcome for research question 2 was based on both conceptual and empirical rationale. According to the ASDOE learning standards for Grade 12 English, students are expected to gain mastery in three separate domains which include Listening & Speaking, Reading and Writing which aligns with the three domains of the remedial English program at ASCC. Additionally, approximately 88 percent of all students from Cohorts 2014 to Cohorts 2017 took English 12 as their highest English course. Examining the English 12 course grade as an outcome enhances the generalizability of the study's findings since most high school graduates enrolled in English 12 as their highest English course.

There are two English domains (Reading and Writing) that make up the remedial English program at ASCC (See Table 1). The fact that students can enroll simultaneously in both English

Reading and English Writing remedial courses in a single semester posed a methodological concern for the current study. For example, there are three remedial English Reading courses (English 70, 80, and 90), three remedial English Writing courses (English 71, 81, and 91) and a college-level English course (English 151) that students can enroll in as their first English course at ASCC. If students enrolled in two English courses in their first semester, there would be 21 different possible combinations of first English course enrollment outcomes. Moreover, ranking these possible combinations of initial English course enrollments into meaningful ordered outcomes for the analysis technique employed in this study may require content expertise which, is beyond the author's background. The author however, looks forward to studying this issue more deeply in future research collaborations with both ASCC and ASDOE.

The current study focused only on the English Writing remedial coursework and first college-level English course as the dependent variable for research question 3. Thus, the dependent variables for research questions 3 and 4 were initial English (English Writing remedial coursework and English 151) and math course enrollment, respectively. Current placement practices at American Samoa Community College identify students in need of remedial education based on their scores on placement exams or other nationally recognized college entrance exams like the SAT, ACT or TOEFL (for English).

Finally, the dependent variable for research question 5 was college graduation. College graduation was recoded as a binary outcome where earning an Associate degree was coded 1. Students who did not earn a college degree according to ASCC's student records were coded 0.

Independent variables

Table 3

Student-level independent variables

Variable	Scale of measurement	Coding convention
Student gender	Nominal	1 = Female 0 = Male
Grade 9 SAT10-Reading	Ordinal	1 = Basic, Proficient or Advanced 0 = Below Basic
Grade 9 SAT10-Math	Ordinal	1 = Basic, Proficient or Advanced 0 = Below Basic
Grade 10 SAT10-Reading	Ordinal	1 = Basic, Proficient or Advanced 0 = Below Basic
Grade 10 SAT10-Math	Ordinal	1 = Basic, Proficient or Advanced 0 = Below Basic
Grade 11 SAT10-Reading	Ordinal	1 = Basic, Proficient or Advanced 0 = Below Basic
Grade 12 SAT10-Reading	Ordinal	1 = Basic, Proficient or Advanced 0 = Below Basic
Grade 12 SAT10-Math	Ordinal	1 = Basic, Proficient or Advanced 0 = Below Basic
High school English 12 course grade	Ordinal	1 = A± or B± 0 = C±, D±, F or Incomplete
Grade 11 absence rate	Ratio	Number of days absent / number of days scheduled multiplied by 100; Grade 11 absence percentage rate was centered to the mean
Grade 12 absence rate	Ratio	Number of days absent / number of days scheduled multiplied by 100; Grade 12 absence percentage rate was centered to the mean
Grade 9 cumulative GPA	Interval	Grade 9 cumulative GPA was centered to the mean
Grade 12 cumulative GPA	Interval	Grade 12 cumulative GPA was centered to the mean
Highest math course attempted in high school	Ordinal	1 = Pre-Calculus, Calculus or Statistics 0 = Algebra 2, Geometry or Algebra 1
High school Algebra 2 course grade	Ordinal	1 = A± or B± 0 = C±, D±, F or Incomplete

The SAT-10 standardized assessment scores received from ASDOE ranked students into four categories which include “Below Basic,” “Basic,” “Proficient” or “Advanced.” Less than 1 percent of students who earned a “Proficient” or “Advanced” on the SAT-10 math for cohort 2015 and 2016. On the other hand, less than 2 percent of students earned “Proficient” or “Advanced” on the SAT-10 Reading. Because very few students across all four cohorts received “Proficient” or “Advanced,” I collapsed the SAT-10 variable for both Math and Reading into two categories where “Basic,” “Proficient” and “Advanced” scores were coded 1 and “Below Basic” scores were coded 0 (Table 3). While being “Proficient” on the SAT-1-0 may be an appropriate benchmark for ASDOE to gauge student achievement, preliminary analyses of the data indicated that proficiency in English or math seems to be a difficult benchmark to achieve since the majority of students earned “Below Basic” scores. Thus, collapsing the scores into two categories may help provide baseline information about the effect, if any, of earning at least a “Basic” or above on the SAT-10 on the indicators of college readiness and success examined in this study.

Both teacher and student absence rates were calculated by taking the number of days a teacher or student was absent and dividing by the number of scheduled work/school days and then multiplying by 100. Absence rates were then transformed to Z-scores to aid in interpreting the regression analyses results. Cumulative GPAs were also transformed into Z-scores for the same reason as the teacher and students’ absence rate variable. For students, grade 11 absence rate was used as an independent variable for research questions 1 and 2 and grade 12 absence rate was used an independent variable for research questions 3 and 4.

Grade 11 attendance data were identified as an independent variable in research questions 1 and 2 for two reasons. First, high school students can enroll in Algebra 2 and/or English 12 during their junior or senior year, so capturing attendance during grade 11 may have a stronger bearing on their grades in these courses. For students who took Algebra 2 and/or English 12 during grade 12, their grade 11 attendance may still matter as it indicates students' level of preparation for these courses. Students with low grade 11 absenteeism may be more prepared to take Algebra 2 and English 12 in their final year of high school compared to their peers who were chronically absent during grade 11. Second, grade 11 absenteeism offers educational leaders and policy makers a relatively longer timeline to plan and implement policies that may help reduce student absenteeism before they enter grade 11. In contrast, using grade 12 absenteeism is too close to high school graduation and any policy changes implemented during students last year of high school may not yield meaningful results.

Grade 12 absence rate, on the other hand, was used as an independent variable for research questions 3 and 4 because it potentially indicates the last year of students' academic preparation in high school before entering college. Grade 12 absence rate is more proximal to college entrance compared to Grade 11 absence rate and, in theory, may offer more explanatory power in explaining the variation in the outcomes for research questions 3 and 4 --- initial English and math course enrollment.

As mentioned earlier, high school Algebra 2 and English 12 course grades were modeled as dependent variables for the first two research questions, respectively. Both Algebra 2 and English 12 course grades were subsequently modeled as independent variables for research questions 3 and 4. For ease of interpretation, the Algebra 2 and English 12 course grades were collapsed into two categories where grades A and B were coded 1 and grades C and below were

coded 0. For example, the Algebra 2 course grade was modeled as an independent variable in research question 4 to predict students' initial math course enrollment at ASCC. The interpretation of the dichotomous Algebra 2 course grade variable compares the difference in the predicted odds of students who earned a B or A grade ("Above average performers") versus students who earned a C± grade or below ("Average" and "Below Average" performers) and their likelihood of enrolling directly in Math 151 (reference outcome category) as their first math course at ASCC.

Grade 9 and Grade 12 cumulative grade point averages were modeled as independent variables for research questions 1 and 2 and research questions 3 and 4, respectively. More specifically, Grade 9 cumulative GPA was modeled as an independent variable to predict students' grades in Algebra 2 and English 12 and Grade 12 cumulative GPA was modeled as the dependent variable to predict students' initial English and math course enrollment at ASCC.

Table 4

Teacher-level independent variables

Variable	Scale of measurement	Coding convention
Teacher gender	Nominal	1 = Female 0 = Male
Percentage - Math teacher absence	Ratio	Number of days absent / number of days scheduled multiplied by 100; Teacher absence percentage rate was centered to the mean
Percentage - English teacher absence	Ratio	Number of days absent / number of days scheduled multiplied by 100; Teacher absence percentage rate was centered to the mean
Praxis I Math certification	Ordinal	1 = Earned Praxis I Math certification 0 = Otherwise
Math teacher highest degree attained	Ordinal	1 = Earned bachelor's degree or higher 0 = Otherwise
Praxis I Writing certification	Ordinal	1 = Earned Praxis I Writing certification 0 = Otherwise
English teacher highest degree attained	Ordinal	1 = Earned bachelor's degree or higher 0 = Otherwise

As Matagi-Tofiga (2011) explained, the American Samoa Department of Education recognizes that highly qualified teachers must possess at least a bachelor's degree and be competent in core content areas. The core content areas are English, reading or language arts, mathematics, science, foreign languages, civics and government, economics, art, history, and geography. Thus, teacher degree attainment variables were dichotomized into two categories where earning at least a bachelor's degree or higher was coded 1 and earning an associate degree or below was coded 0 (Table 4). Praxis I certification was used in this study as a measure of content area competency in Math and Writing. Thus, teachers who passed Praxis I Math or Praxis I Writing certification were coded 1. Teachers who did not pass the Praxis I certification were coded 0.

Preparing for postsecondary coursework while in college may be too late. A growing body of research indicates that the trajectory to college readiness begins earlier in students' K-12 experiences (Hein, Smerdon & Sambolt, 2013). Examining the extent to which the dependent and independent variables examined in this study are related to college readiness and success can provide useful and context-specific information about American Samoa students' transition from American Samoa Department of Education's public high schools to the local American Samoa Community College.

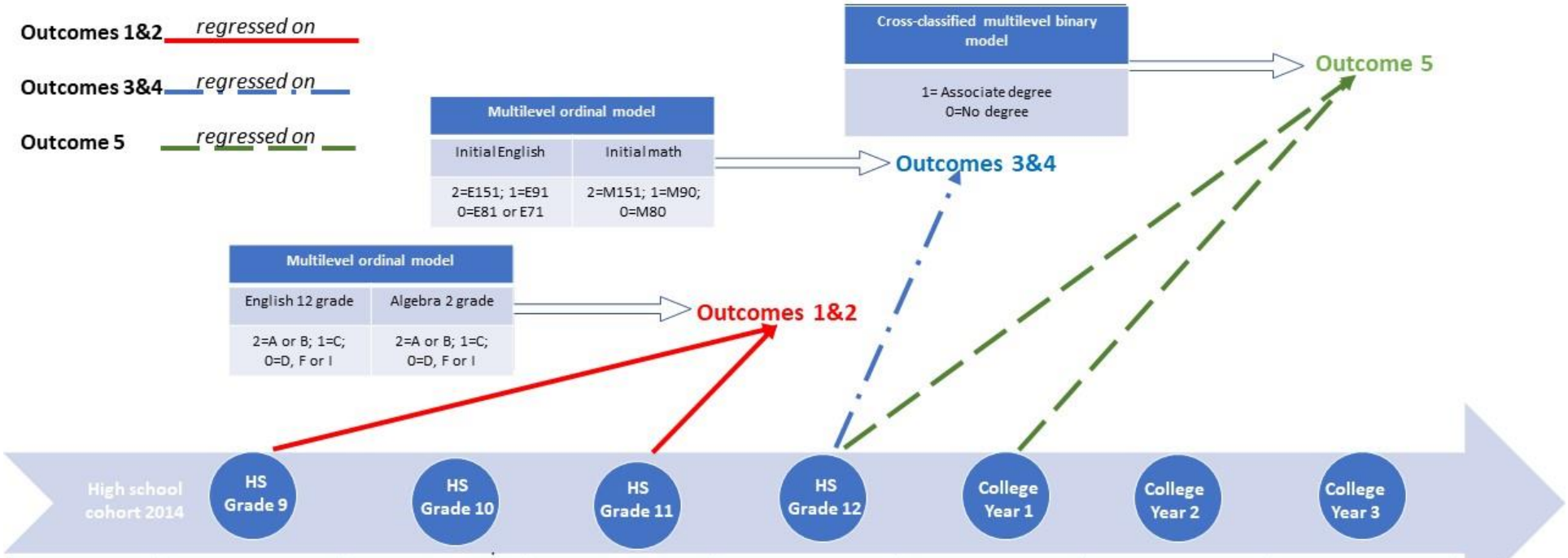
Analytic Strategy

Multilevel analysis enhances the validity of statistical inferences by partitioning the variability in the clustered data and examining these variances separately according to their presumed hierarchical structure. Failure to address data dependency can lead to erroneous claims where an observed relationship in the population does not necessarily reflect was is happening at

the individual level. Much of educational data are clustered in diverse ways which make it difficult to satisfy the data independence assumption. For example, students in a school are clustered by classrooms, ethnic composition or by religious affiliation. These clustering effects may manifest its influence, either salient or latent, in the formation of shared characteristics among students which, if unaccounted for, violate the data independence assumption.

This study examined the extent to which high school and college data are associated empirically with high school students' college readiness in American Samoa. More specifically, the study employed multilevel analysis techniques to understand the extent to which both student-level and teacher-level characteristics explain the variability in students' grades in specific high school courses (Algebra 2 and English 12), initial English and math course enrollment in college and earning a degree within three years of initial enrollment. All multilevel analyses were performed using the generalized linear mixed-model routines in SPSS 25.

To help address possible confusion about the design of the current study, Figure 3 illustrates the study's approach to examining college readiness and success in American Samoa. The arrows pointing to the "outcomes" indicate the variables to which the outcomes were regressed. For example, English 12 course grade (Outcome 1), was regressed on both student- and teacher-level predictor variables. The student-level predictor variables included gender, SAT-10 Reading (grade 9 or grade 11, if available), grade 9 cumulative GPA, Special Education status (if available), and grade 11 attendance. Teacher-level variables included teacher's gender, Praxis I Writing certification, highest degree attained and attendance data during the year the teacher taught English 12. Subsequent outcomes show the predictor variables (both student and teacher, if applicable) that were examined in the regression analyses.



Demographic data	Gender SPED			Gender SPED	Gender Full-time/Part-time Degree-seeking		
Achievement data	SAT-10 Cumulative GPA		SAT-10	Cumulative GPA SAT-10 On-time graduation Highest math course Algebra 2 grade English 12 grade	Initial English course Initial math course		Earned Associate degree
Behavioral data			Attendance	Attendance			
Teacher data	Gender; Degree attained; Praxis I certification; Attendance				Initial math course instructor; Initial English course instructor		

Figure 4. Analytic strategy for the current study.

Research Questions 1 and 2

To what extent do students' grades in Algebra 2 (or English 12) vary as a function of both teacher-level (attendance, teaching certification, highest degree attained) and student-level characteristics (high school grade-point average, SAT-10 score, and attendance)?

The analytic sample for research questions 1 and 2 included only high school student- and teacher-level cases with complete data used in the multilevel ordinal logistic regression. Since the SAT-10 test was administered in different grade levels across three cohorts (SAT-10 was not administered in cohort 2017), combining the cohorts into one sample would substantially reduce the number of cases to be included in the multilevel analyses when using listwise deletion method for missing data. For example, including grade 9 SAT-10 scores in the analyses would remove more than half of student-level cases from the sample because the SAT-10 test was not administered in cohort 2014 and cohort 2017 which could potentially bias the results. On the other hand, although leaving the SAT-10 test scores out of the analyses would substantially increase the study's sample size, omitting SAT-10 scores from the model would lead to less optimal results given that SAT-10 scores have been shown to be associated strongly with academic achievements (Achieve, 2011; Atkinson & Geiser, 2009; Cohen, 2008; Porter & Polikoff, 2012; Wiley et al., 2010). To address this issue, the author analyzed each cohort separately to maximize the availability and utility of both student and teacher level data in predicting student performances in Algebra 2 and English 12.

Multilevel ordinal logistic models were used to examine how high school student and high school teacher factors relate to grades in high school English 2 and Algebra 2. Equations 1-4 list different logistic regression models to help illustrate the analytic strategies for modeling data for research questions 1 and 2. The multilevel modeling technique decomposes the total

variance of the outcome variable into separate variances at each level of the nested data. Unlike multilevel regression models with continuous outcomes, level-1 residuals cannot be calculated for ordinal response models (Heck, Thomas & Tabata, 2012).

Equation 1 is the Level-1 model predicting the likelihood of a student with a certain SAT-10 score earning B± or A± grade in Algebra 2 compared to the odds ratio of being in the other two categories combined (C± or D±,F, Incomplete). Subsequent equations illustrate the current study's approach to understanding factors that contribute to college readiness in American Samoa. The outcome under consideration in the following example is Algebra 2 course grade where D±, F or Incomplete grade were coded 0, C± grade was coded 1 and B±, A± grades were coded 2.

Level-1 model predicting Algebra 2 grade

$$log(\pi_{cij}/(1-\pi_{cij})) = \beta 0_j + \Theta_c + \beta 1_j SAT10_{ij} \qquad \textit{(Equation 1)}$$

Where:

$(\pi_{cij}/(1-\pi_{cij}))$ is the odds of being at or above the *c*th category relative to the other categories in the outcome variable, i.e., the ratio of the probability of being in the category of interest for the outcome variable which, in this case, is grade in Algebra 2.The ratio is then converted to the log odds, $log(\pi_{cij}/(1-\pi_{cij}))$ of earning a A± or B± (2) versus the odds of being in the combined lower categories, C± (1) and D±, F, or Incomplete (0).

c: Category of interest to be compared to other categories in the ordinal response outcome.

i: Student

j: High school classroom

$\beta 0_j$: Threshold that is allowed to vary across groups at level 2. Also, this parameter is the expected log odds of being in the category of interest relative to the other categories within the outcome variable for student *I* in high school classroom *j* when the recoded value for SAT-10 is set to zero.

$\beta 1_j$: the effect of the student's high school SAT-10 score in predicting the Algebra 2 grades. More specifically, this parameter functions as the differentiating effect of SAT-10 scores on the expected log odds of being in the category of interest relative to the other categories of the outcome variable for student *i* in high school classroom *j*.

Θ_c; Fixed thresholds which separate the ordered categories of the outcome.

Level-2 model predicting Algebra 2 grades

The level-2 model investigates differences in student's Algebra 2 grades that are explained by teacher factors. A random intercept model was implemented while holding the slope to be fixed across classrooms. Equation 2 and 3 illustrate the study's approach to modeling level-2 units.

$$\beta 0_j = \gamma_{00} + \gamma_{01}*(\text{MathTeachDeg}) + \gamma_{02}*(\text{MathTeachCred}) + u_{0j} \quad \textit{(Equation 2)}$$

$$\beta 1_j = \gamma_{10} \quad \textit{(Equation 3)}$$

Where:

γ_{00}: Expected log odds of being placed in the category of interest relative to the other categories in the outcome after adjusting for math teacher's degree and math teacher's teaching certificate

γ_{01}: Regression coefficient associated with the math teacher's degree (MathTeachDeg) for high school classroom *j*

γ_{02}: Regression coefficient associated with math teacher's teaching certificate for high school classroom *j*

γ_{10}: Fixed level-1 slope

u_{0j}: Random effects of classroom *j* adjusted for math teacher degree and math teacher teaching certificate

Mixed-model predicting Algebra 2 grades

Equation 4 shows the mixed-model predicting grades in Algebra 2.

$$log(\pi_{cij}/(1-\pi_{cij})) = \gamma_{00} + \Theta_c + \gamma_{01}\text{MathTeachDeg}_j + \gamma_{02}\text{MathTeachCred}_j + \gamma_{10}SAT10_{ij} + u_{0j} \quad \textit{(Equation 4)}$$

Research Questions 3 and 4

To what extent do student's initial English (or math) course enrollment at ASCC vary as a function of both teacher-level (e.g., teaching certification, highest degree attained and teacher absenteeism rate) and student-level characteristics (high school grade-point average, SAT score, highest English course completed, and attendance)?

A total of 268 high school graduates from the 2014 cohorts enrolled at ASCC during Summer 2014, Fall 2014 or Spring 2015 semester. The analytic sample for research questions 3 and 4 included only students with available data on both independent and dependent variables. Initial English and math course enrollment were modeled separately as outcomes using multilevel ordinal regression (see appendix A for more information on English and math samples). Equations 5-8 list different logistic regression models to illustrate how multilevel modeling technique decomposes the total variance of the outcome variable into separate

variances at each level of the nested data. As mentioned earlier, level-1 residuals cannot be calculated ordinal response models (Heck, Thomas & Tabata, 2012).

Equation 5 is the Level-1 model predicting the likelihood of an individual student with a certain Algebra 2 grade being placed in one of three math courses upon initial entry to American Samoa Community College and offers an example of the current study's approach to understanding factors that contribute to college readiness in American Samoa. The outcome under consideration in the following example is the different levels of initial math course enrollment by sequential order where Math 80 was coded 0, Math 90 coded 1 and Math 151 coded 2.

Level-1 model predicting initial math course enrollment

$$log(\pi_{cij}/(1-\pi_{cij})) = \beta 0_j + \Theta_c + \beta 1_j HSAlg2Grade_{ij} \quad \textit{(Equation 5)}$$

Where:

$(\pi_{cij}/(1-\pi_{cij}))$ is the odds of being at or above the *c*th category relative to the other categories in the outcome variable, i.e., the ratio of the probability of being in the category of interest for the outcome variable which, in this case, is first math course a student was enrolled in at ASCC ($FirstMathCourse_{cij}$). The ratio is then converted to the log odds, $log(\pi_{cij}/(1-\pi_{cij}))$, of being in Math 151 (2) versus the odds of being in the combined lower categories, Math 90 (1) and Math 80 (0).

c: Category of interest to be compared to other categories in the ordinal response outcome.

i: Student

j: High school classroom

$\beta 0_j$: Threshold that is allowed to vary across groups at level 2. Also, this parameter is the expected log odds of being in the category of interest relative to the other categories within the outcome variable for student *I* in high school classroom *j* when the recoded value for high school Algebra 2 grade ($HSAlg2Grade_{i(jk)}$) is set to zero.

$\beta 1_j$: A structural parameter describing the effect of the students' high school Algebra 2 grade in predicting the first math course in college. More specifically, this parameter functions as the differentiating effect of Algebra 2 grades on the expected log odds of being in the category of interest relative to the other categories of the outcome variable for student *i* in high school classroom *j*.

Θ_c; Fixed thresholds which separates the ordered categories of the outcome.

Level-2 model predicting initial math course enrollment

The level-2 model investigates differences in student's initial math course enrollment that are explained by teacher factors. For this analysis, a random intercept model was implemented while holding the slope to be fixed across classrooms. Equations 6 and 7 show the Level-2 model predicting initial math course enrollment

$$\beta 0_j = \gamma_{00} + \gamma_{01}*(\text{MathTeachDeg}) + \gamma_{02}*(\text{MathTeachCred}) + u_{0j} \quad \textit{(Equation 6)}$$

$$\beta 1_j = \gamma_{10} \quad \textit{(Equation 7)}$$

Where:

γ_{00}: Expected log odds of being placed in the category of interest relative to the other categories in the outcome after adjusting for math teacher's degree and math teacher's teaching certificate

γ_{01}: Regression coefficient associated with the math teacher's experience (MathTeachDeg) for high school classroom *j*

γ_{02}: Regression coefficient associated with math teacher's teaching certificate for high school classroom *j*

γ_{10}: Fixed level-1 slope

u_{0j}: Random effects of classroom *j* adjusted for math teacher degree and math teacher teaching certificate

Mixed-model predicting initial math course enrollment

Equation 8 shows the mixed-model predicting initial math course enrollment.

$$log(\pi_{cij}/(1-\pi_{cij})) = \gamma_{00} + \Theta_c + \gamma_{01}\text{MathTeachDeg}_j + \gamma_{02}\text{MathTeachCred}_j + \gamma_{10}HSAlg2Grade_{ij} + u_{0j} \quad \textit{(Equation 8)}$$

Research Question 5

To what extent does earning a college degree within three years of initial enrollment at ASCC vary as a function of teacher-level (teaching certification, highest degree attained and teacher absenteeism rate) and student-level characteristics (high school grade-point average, SAT-10 score, initial English course enrollment and attendance)?

Since the current study tracks students' educational journeys from high school to college, students are assumed to be cross-classified in multiple level-2 units as they transition from secondary to post-secondary classrooms. For example, a college student who is nested in a high school classroom is also separately nested in a college classroom. Students' multiple memberships across level-2 hierarchical data structures warrant the application of cross-classified multilevel models (CCMM). One of the advantages of using CCMM is that it simultaneously examines the critical influences of both high school and college (both of which are level-2 hierarchal data structures) on students' college success. Traditional two-level

multilevel models examining high school classroom influence on college readiness may overstate the effect of high school teachers in explaining the variability in students' postsecondary outcomes. Perhaps, some of the outcome variances are better explained by students' college teachers. Rather than modeling the data with traditional level-2 multilevel models, research question 5 employed a cross-classified multilevel model to examine the influence of both high school and college level factors simultaneously on students' college success. As in the previous analyses, level-1 residuals cannot be calculated for ordinal response models (Heck et al., 2012).

At ASCC, each remedial English course is taught by a single instructor. For example, all students who enrolled in English 91 were taught by the same instructor. English 71, 81 and English 151 are each taught by three separate instructors. Because of this teaching configuration, the initial English course enrollment at ASCC was treated as separate level-2 units where students are cross-classified into at the college-level.

Multilevel cross-classified model was employed to model the relationship between student and teacher factors and their influence on student's likelihood to graduate from American Samoa Community College with an Associate degree (Equations 9-12). Because graduation data was coded as a binary outcome, the interpretion of the model is similar to the previous multilevel ordinal models with only one comparison category to the reference outcome category.

For the student-level model (level-1 model) for individual *i* cross-classified by high school teacher *j* and college classroom *k*, the model can be specified as follows where the subscript *i*(*jk*) is used to denote that individual *I* is cross-classified in two different classroom settings:

Level-1 model predicting graduation from college

$$log(\pi_{i(jk)}/(1-\pi_{i(jk)})) = \beta 0_{jk} + \beta 1_{jk} English12Grade_{i(jk)} \quad \textit{(Equation 9)}$$

Where:

$(\pi_{i(jk)}/(1-\pi_{i(jk)}))$ is the odds ratio of graduating from college relative to not graduating. The odds ratio is then converted to the log odds, $log(\pi_{i(jk)}/(1-\pi_{i(jk)}))$, of graduating versus not graduating for student *i* who is cross-classified into high school classroom *j* and college classroom *k*.

i: Student

j: High school classroom

k: College classroom

$\beta 0_{jk}$: Threshold that is allowed to vary across groups at level 2. Also, this parameter is the expected log odds of graduating for student *i* who is cross-classified in high school classroom *j* and college classroom *k* when the recoded value for high school English 12 grade ($English12Grade_{i(jk)}$) is set to zero.

$\beta 1_{jk}$: A structural parameter describing the effect of the student's high school English 12 grade in predicting the college graduation. More specifically, this parameter functions as the differentiating effect of English 12 grades on the expected log odds graduating for student *i* who is cross-classified in high school classroom *j* and college classroom *k*

Level-2 model predicting grade in first college-level math course

The level-2 model investigates unique effect of high school and college classrooms on the likelihood of students graduating college. A random intercept model was employed while holding the slope to be fixed across level-2 units.

$\beta 0_{(jk)} = \gamma_{00} + \gamma_{01}*(\text{EnglishTeachDeg}_j) + \gamma_{02}*(\text{InitialEngEnroll}_k) + u_{01j} + u_{02k} + u_{03jk}$ *(Equation 10)*

$\beta 1_{(jk)} = \gamma_{10}$ *(Equation 11)*

Where:

γ_{00}: The expected log odds of graduating college adjusted for high school math English teacher's degree and initial English course enrollment in college

γ_{01}: Regression coefficient associated with high school English teacher degree (EnglishTeachDeg_j)

γ_{02}: Regression coefficient associated with initial English course enrollment ($\text{InitialEngEnroll}_k$)

γ_{10}: Fixed level-1 slope

u_{01j}: High school level-2 random effect

u_{02k}: College level-2 random effect

u_{03jk}: Random effect associated with being in a particular high school and college classroom

<u>Mixed-model predicting grade in first college-level math course</u>

$log(\pi_{i(jk)}/(1-\pi_{i(jk)})) = \gamma_{00} + \gamma_{01}*(\text{EnglishTeachDeg}_j) + \gamma_{02}*(\text{InitialEngEnroll}_k) + \gamma_{10(jk)}English12Grade_{i(jk)} + u_{01j} + u_{02k} + u_{03jk}$ *(Equation 12)*

CHAPTER 4

RESULTS

Results for each research question were organized into two sections. The first section provides the descriptive result for each variable that was used in the regression analyses. Variables were separated and reported based on data type. That is, descriptive statistics for categorical data and continuous data were reported in separate tables for each research questions. The second section provides the results for the multilevel logistic regression analyses.

Research Question 1

Data for four high school cohorts were received from the American Samoa Department of Education. As described earlier, cohorts were analyzed separately to maximize the number of cases to be included in the analyses. The sample sizes reported here include only students and teachers with available data on the variables used for the multi-level analyses. Readers can find more information on the attrition rate for the analytic sample in Appendix A.

Results for descriptive statistics with Algebra 2 grade

Table 5

Descriptive statistics for student-level categorical variables

Variable	Coding convention	Cohort 2014 (n = 465)	Cohort 2015 (n = 596)	Cohort 2016 (n = 670)	Cohort 2017 (n = 803)
Student gender	1 = Female 0 = Male	50.5 49.5	53.7 46.3	49.0 50.0	48.2 51.8
Grade 9 SAT10-Math	1 = Basic or beyond 0 = Below Basic	NA	13.3 86.7	11.3 88.7	NA
Grade 10 SAT10-Math	1 = Basic or beyond 0 = Below Basic	NA	10.6[a] 89.4	NA	NA
Grade 11 SAT10-Math	1 = Basic or beyond 0 = Below Basic	NA	NA	NA	NA
Grade 12 SAT10-Math	1 = Basic or beyond 0 = Below Basic	14.0 86.0	7.1[b] 92.9	NA	NA
Highest math course attempted in high school	1 = Beyond Algebra 2 0 = Algebra 2 or below	46.2 53.8	46.1 53.9	41.3 58.7	39.1 60.9
High school Algebra 2 course grade	2 = B± or A± 1 = C± 0 = D±, F or Incomplete	56.1 25.8 18.1	52.7 26.2 21.1	44.0 28.4 27.6	53.7 22.4 23.9
Special education status	1 = Yes 0 = No	1.7 98.3	3.5 96.5	0.0 100	3.1 96.9

Notes: NA = scores not available.
[a]n = 564. [b]n = 539.

SAT-10 Reading was administered three times during cohort 2015 (grades 9, 10 and 12). The SAT-10 score for the earliest test administration was used for the multilevel analyses and thus served as one of the criterion variables used to create the final high school math analytic sample (Table 5). Students who earned Basic or beyond (Proficient or Advanced) on the SAT-10 math ranged from 7.7 percent to 14.0 percent across all four cohorts and school years the test was administered. Students who earned a B± or A± grade in Algebra 2 ranged between 44.0 percent in cohort 2016 to 56.1 percent in cohort 2014.

Table 6

Descriptive statistics for student-level continuous variables

Variable	Cohort 2014 Mean (SD)	Cohort 2015 Mean (SD)	Cohort 2016 Mean (SD)	Cohort 2017 Mean (SD)
Grade 11 absent percent – Mean (SD)	1.4 (3.4)	25.0 (17.4)	20.8 (14.7)	19.6 (14.6)
Grade 9 cumulative GPA – Mean (SD)	2.94 (.69)	3.04 (.64)	2.89 (.75)	2.94 (.80)

The average percentage of grade 11 absences shifted considerably from 1.4 (SD 3.4) percent in cohort 2014 to 25.0 (SD 17.4) in cohort 2015 (Table 6). This shift may be partly explained by changes in the way student data were captured over the years. One of the data managers from ASDOE reported that one of the first definitions of student absence was when a student was not in the classroom before the first period began (M. Mamea, personal communication, 2016). Over the years, this definition has evolved to the current operational definition where if a student was absent for any period throughout the day, that student was marked absent for that day. Grade 9 cumulative GPA ranged from 2.94 in cohorts 2014 and 2017 to 3.04 in cohort 2015.

Table 7

Descriptive statistics for high school teacher-level categorical variables

Variable	Coding convention	Cohort 2014 (n = 16)	Cohort 2015 (n = 22)	Cohort 2016 (n = 23)	Cohort 2017 (n = 23)
Math teacher gender	1 = Female 0 = Male	56.3 43.8	45.5 54.5	47.8 52.2	43.5 56.5
Praxis I Math certification	1 = Earned Praxis I Math certification 0 = Otherwise	25.0 75.0	18.2 81.8	17.4 86.2	8.7 91.3
Math teacher highest degree attained	1 = Bachelor degree or higher 0 = Otherwise	87.5 12.5	77.3 22.7	82.6 17.4	87.0 13.0

Majority of the teachers across all four cohorts had at least a bachelor's degree or higher. Additionally, most teachers did not have Praxis I Math certification across all four cohorts (Table 7).

Table 8

Descriptive statistics for high school teacher-level continuous variable

Variable	Cohort 2014 Mean (SD)	Cohort 2015 Mean (SD)	Cohort 2016 Mean (SD)	Cohort 2017 Mean (SD)
Percentage – Math teacher absence	12.6 (19.7)	14.7 (24.0)	9.6 (18.3)	4.2 (5.8)

The average absence rate for English teachers reduced substantially from 12.6 (SD 19.7) percent in cohort 2014 to 4.2 (SD 5.8) in cohort 2017 (Table 8).

Results for Multilevel Logistic Modeling with Algebra 2 Grade

Results from the multilevel ordinal models examining the influence of both student and teacher factors on students Algebra 2 course performances are highlighted in Table 16. The result section for the multilevel models was organized by demographic, academic performance and behavioral variables to better highlight the unique effects of each variable on the outcomes. For ease of interpretation, grade 9 cumulative GPA and grade 11 absences were centered to the mean and transformed to Z-scores. Overall, both students and teacher-level factors performed variably across cohorts in impacting the predicted odds of earning an A± or B± grade in Algebra 2 versus earning a C± grade or lower grades (D±, F, I).

Table 9

Fixed and Random Effects of Student-level and Teacher-level Predictors on Multilevel models with Algebra 2

	Model with student-level predictors only				Model with both student- and teacher-level predictors			
	Cohort 2014	Cohort 2015	Cohort 2016	Cohort 2017	Cohort 2014	Cohort 2015	Cohort 2016	Cohort 2017
Intercepts								
Threshold 0 (Below C-)	-1.39 (.47)**	-1.77 (.21)**	-1.51 (.28)**	-1.64 (.34)**	-1.35 (.47)**	-1.78 (.21)**	-1.38 (.26)**	-1.36 (.49)**
Threshold 1 (C±)	-0.07 (.45)	-0.03 (.21)	-0.39 (.25)	0.05 (.32)	0.12 (.45)	-0.03 (.29)	0.54 (.26)*	0.32 (.46)
Fixed Effects								
Student-level								
Gender	0.16 (.19) [1.17]	.37 (.19) [1.44]	0.05 (.15) [1.05]	0.18 (.13) [1.20]	0.14 (.19) [1.15]	0.38 (.20) [1.47]	0.02 (.16) [1.02]	0.17 (.13) [1.19]
Grade 9 Z-CGPA	0.74 (.11)** [2.10]	.89 (.10)** [2.43]	1.12 (.12)** [3.06]	1.20 (.14)** [3.32]	.72 (.12)** [2.06]	0.90 (.09)** [2.45]	1.05 (.12)** [2.85]	1.20 (.14)** [3.31]
Grade 9 SAT-10 Math		0.73 (.24)** [2.07]	1.07 (.26)** [2.92]			0.73 (.24)** [2.08]	1.06 (.25)** [2.90]	
Grade 12 SAT-10 Math	0.53 (.37) [1.70]				.52 (.38) [1.68]			
Grade 11 Z-Absence	-0.24 (.49) [.79]	-0.55 (.11)** [.58]	-0.94 (.16)** [.39]	-0.70 (.10)** [.50]	-0.16 (.56) [.85]	-0.56 (.11)** [.57]	-0.98 (.15)** [.38]	-0.70 (.11)** [.50]
HS Teacher-level								
Gender					.37 (35) [1.45]	0.03 (.49) [1.03]	0.47 (.36) [1.57]	0.49 (.66) [1.64]
Teacher Z-absence					-0.24 (.13) [.79]	-0.06 (.16) [.94]	-.44 (.21)* [.64]	-0.16 (.13) [.86]
Random Effect								
Teacher-level	0.20 (.14)	.88 (.41)*	.80 (.34)*	2.28 (.82)**	.29 (.21)	1.01 (.47)*	0.65 (.30)*	2.20 (.82)**

Note. (SE) = standard error; [OR] = odds ratio.
*$p < .05$. **$p < .01$.

Demographic predictors

Gender was not significantly related to students' predicted odds of earning an A± or B± grade compared with the combined lower grade categories across all cohorts. However, females predicted odds of earning an A± or B± grade in Algebra 2 compared to the combined lower grade categories was marginally significant (p = .056) (Table 9).

Academic performance predictors

Grade 9 cumulative GPA revealed a strong and consistent association with students' likelihood of earning a B± or A± in Algebra 2 compared to the lower categories after controlling for other variables in the study. The influence of grade 9 cumulative grade point average was most pronounced in cohort 2017 in impacting students' likelihood of earning a B± or A± grades compared to the lower categories. More specifically, for 1-SD (.8) increase in grade 9 cumulative grade point average from the mean (2.94), the predicted odds of earning a B± or A± grade versus the combined lower categories were increased by 3.31 times ($p < .01$) after controlling for both student- and teacher-level variables in the model. SAT-10 scores were also associated with the predicted log odds of earning a B or A grade when it was administered during 9th grade of cohort 2015 and cohort 2016. In cohort 2016, earning at least a "Basic" score on the SAT-10 math in 9th grade improves students predicted odds of earning an A± or B± grade in their Algebra 2 course compared to combined lower grade categories by 2.9 ($p < .01$) times controlling for both student and teacher-level variables in the model.

Behavioral predictors

Grade 11 absences affected the predicted odds of earning a B± or A± grade compared to the combined lower categories across cohorts 2015, 2016 and 2017 while grade 11 absences in cohort 2014 did not impact the predicted odds of earning a B± or A± grade compared to the

combined lower categories while holding all other variables in the model constant. The effect of grade 11 absences was most pronounced during cohort 2016, where a 1-SD increase (14.7) in 11^{th} graders absences from the mean (20.8) decreased the expected odds of earning an A± or B± grade compared to the combined lower grade categories by a factor of 0.38 (or reduced by 62%) controlling for both student and teacher level variables in the model. Teacher attendance in cohort 2016 was also associated with students' predicted odds of earning an A± or B± grade versus earning C± or lower. A 1-SD (18.3) increase in teacher absences from the mean (9.6) decreased students predicted odd of earning an A± or B± in Algebra 2 versus earning C± or below by .64 factors (or reduced by 36 percent) controlling for all variables in the model.

Research Question 2

As described earlier, cohorts were analyzed separately to maximize the number of cases to be included in the analyses. The sample sizes reported here include only students and teachers with available data on the variables used for the multi-level analyses. Readers can find more information on the attrition rate for each analytic sample in appendix A.

Results for descriptive statistics with English 2 grade

Table 10

Descriptive statistics for student-level categorical variables

Variable	Coding convention	Cohort 2014 (n = 474)	Cohort 2015 (n = 519)	Cohort 2016 (n = 562)	Cohort 2017 (n = 633)
Student gender	1 = Female 0 = Male	49.6 50.4	52.2 47.8	50.9 49.1	48.2 51.8
Grade 9 SAT10-Reading	1 = Basic or beyond 0 = Below Basic	NA	21.8 78.2	23.0 77.0	NA
Grade 10 SAT10-Reading	1 = Basic or beyond 0 = Below Basic	NA	17.7[b] 82.3	NA	NA
Grade 11 SAT10-Reading	1 = Basic or beyond 0 = Below Basic	12.7 87.3	NA	NA	NA
Grade 12 SAT10-Reading	1 = Basic or beyond 0 = Below Basic	20.4[a] 79.6	15.4[c] 84.6	NA	NA
High school English 12 course grade	2 = A± or B± 1 = C± 0 = D±, F or Incomplete	57.6 21.7 20.7	58.6 22.0 19.5	58.2 22.2 19.6	65.7 21.3 13.0
Special education status	1 = Yes 0 = No	4.6 95.4	3.9 96.1	0.0 100	3.2 96.8

Note. NA = Scores not available.
[a]n = 442. [b]n = 491. [c]n = 467.

SAT-10 Reading was administered twice in cohort 2014 (grades 11 and 12) and three times in cohort 2015 (grades 9, 10 and 12) (Table 10). The SAT-10 score for the earliest test administration was used for the multilevel analyses and thus served as one of the criterion variables used to create the final analytic sample. Students who earned Basic or beyond (Proficient or Advanced) ranged from 15.5 percent to 23.0 percent on the SAT-10 Reading

across all four cohorts, and school years the test was administered. Students who earned a B or A grade in English 12 ranged between 57.6 percent to 65.7 percent across all four cohorts.

Table 11

Descriptive statistics for student-level continuous variables

Variable	Cohort 2014 Mean (SD)	Cohort 2015 Mean (SD)	Cohort 2016 Mean (SD)	Cohort 2017 Mean (SD)
Grade 11 percent absent	1.88 (4.0)	25.5 (17.7)	19.8 (14.2)	18.7 (13.7)
Grade 9 cumulative GPA	2.87 (.75)	3.01 (.67)	2.89 (.75)	2.99 (.71)

The average percentage of grade 11 absences shifted substantially from 1.88 (SD 4.0) percent during cohort 2014 to 25.5 (SD 17.7) in cohort 2015 (Table 11). Grade 9 cumulative GPA across all four cohorts ranged from 2.87 in cohort 2014 to 3.01 in cohort 2015.

Table 12

Descriptive statistics for high school teacher-level categorical variables

Variable	Coding convention	Cohort 2014 (n = 10)	Cohort 2015 (n = 10)	Cohort 2016 (n = 11)	Cohort 2017 (n = 14)
English teacher gender	1 = Female 0 = Male	60.0 40.0	90.0 10.0	54.5 45.5	64.3 35.7
Praxis I Writing certification	1 = Earned Praxis I Writing certification 0 = Otherwise	30.0 70.0	20.0 80.0	9.1 90.9	14.3 85.7
English teacher highest degree attained	1 = Bachelor's degree or higher 0 = Otherwise	100 0.0	90.0 10.0	100 0.0	100 0.0

The majority of English teachers did not have Praxis I Writing certification across all four cohorts. All English teachers included in the study samples from cohorts 2014, 2016 and 2017 had a bachelor's degree or higher (Table 12).

Table 13

Descriptive statistics for high school teacher-level continuous variable

Variable	Cohort 2014 Mean (SD)	Cohort 2015 Mean (SD)	Cohort 2016 Mean (SD)	Cohort 2017 Mean (SD)
English teacher percent absent	17.0 (22.1)	2.1 (1.7)	7.5 (7.7)	5.0 (5.6)

The average percentage of English teacher absences reduced substantially from 17.0 (SD 22.1) percent in cohort 2014 to 2.1 (SD 1.7) in cohort 2015. Like student attendance data from cohort 2014 to cohort 2015, the definition for the capturing teacher attendance changed between cohorts 2014 to cohorts 2015 (Table 13).

Results for Multilevel Logistic Modeling with English 12 Grade

Like the Algebra 2 results, some student- and teacher-level factors performed variably across cohorts in impacting students' predicted odds of earning an A± or B± grade in high school English 12 versus earning a C± grade or lower grades (D±, F, I).

Table 14

Fixed and Random Effects of Student-level and Teacher-level Predictors Multilevel models with English 12

	Model with student-level predictors only				Model with both student- and teacher-level predictors			
	Cohort 2014	Cohort 2015	Cohort 2016	Cohort 2017	Cohort 2014	Cohort 2015	Cohort 2016	Cohort 2017
Intercepts								
Threshold 0 (Below C-)	-1.80 (.45)**	-2.84 (.66)**	-2.02 (.42)**	-2.29 (.38)**	-1.87 (.47)**	3.42 (1.06)**	-1.30 (.30)**	-1.29 (.45)**
Threshold 1 (C±)	-0.28 (.47)	-0.91 (.62)	-0.32 (.37)	-0.57 (.38)	-0.29 (.43)	5.36 (.95)**	0.41 (.32)	0.43 (.44)
Fixed Effects								
Student-level								
Gender	0.63 (.20)** [1.88]	0.20 (.18) [1.22]	0.06 (.22) [1.06]	0.59 (.21)** [1.81]	0.63 (.20)** [1.87]	0.20 (.18) [1.22]	0.04 (.20) [1.04]	0.60 (.21)** [1.83]
Grade 9 Z-CGPA	1.15 (.18)** [3.17]	1.04 (.15)** [2.82]	0.70 (.12)** [2.01]	0.89 (.12)** [2.44]	1.63 (.18)** [3.20]	1.03 (.16)** [2.80]	0.70 (.12)** [2.02]	0.90 (.12)** [2.47]
Grade 9 SAT-10 Reading		0.32 (.50) [1.37]	0.71 (.26)** [2.04]			0.32 (.50) [1.37]	0.69 (.25)** [1.99]	
Grade 11 SAT-10 Reading	1.53 (.31)** [4.63]				1.53 (.32)** [4.63]			
Grade 11 Z-Absence	-0.13 (.18) [.88]	-0.67(.13)** [.51]	-0.65 (.15)** [.52]	-0.50 (.11)** [.61]	-0.14 (.18) [.87]	-0.67 (.14)** [.51]	-0.63 (.15)** [.54]	-0.48 (.11)** [.62]
HS Teacher-level								
Gender					1.20 (1.13) [.36]	3.94 (.43)** [3.10]	0.95 (.40)* [2.59]	0.94 (.57) [2.55]
English teacher Z-Absence					-0.16 (.34) [.88]	-7.11 (2.86)** [.001]	-1.10 (.66)* [.33]	-1.92 (.69)** [.15]
Random Effect								
Teacher-level	1.79 (1.01)	3.99 (2.02)*	1.45 (.70)*	1.72 (.81)*	2.15 (1.33)	2.45 (1.48)	1.31 (.70)	1.30 (.67)

Note. (SE) = standard error; [OR] = odds ratio.
*$p < .05$. **$p < .01$.

Demographic predictors

Gender was associated with student's predicted odds of earning an A± or B± grade in English 12 versus to earning a C± or D±, F, I grade in cohorts 2014 and 2017 controlling for both student and teacher level factors (Table 14). That is, the predicted odds of earning an A± or B± grade in English 12 compared to the combined lower grade categories increased by 1.87 times ($p < .01$) for females compared to males in cohort 2014 controlling for both students- and teacher-level variables. During cohort 2017, the predicted odds of earning an A± or B± grade compared to the combined lower grade categories in English 12 increased by 1.83 times ($p < .01$) for females compared to males controlling for both students- and teacher-level variables in the model.

Academic performance predictors

Like the models predicting Algebra 2 grades, grade 9 cumulative GPA showed a strong and consistent relationship with student's likelihood of earning a B± or A± in English 12 compared to earning a C± or D±, F, I grade after controlling for both student- and teacher-level predictors in the model. The effect of grade 9 cumulative grade point average was most pronounced in cohort 2014 on increasing students' likelihood of earning a B± or A± grade in English 12 compared to the lower categories. More specifically, for 1-SD increase (.75) in grade 9 GPA from the mean (2.87), the predicted odds of earning a B± or A± grade versus earning a C± grade or below were increased by 3.20 times ($p < .01$) after controlling for both student and teacher level variables in the model. SAT-10 Reading scores were also associated with the predicted log odds of earning a B± or A± grade versus earning a grade in the lower grade categories in cohort 2014 and 2016. In cohort 2016, scoring at least a "Basic" score on the SAT-

10 Reading in 9th grade improved students predicted odds of earning an A± or B± grade in their English 12 course compared to combined lower grade categories by 1.99 ($p < .01$) times controlling for both student- and teacher-level variables in the model. Similarly, grade 11 students who earned at least a "Basic" score on the SAT-10 Reading in cohort 2014 improved their predicted odds of earning an A± or B± grade in their English 12 course compared to the combined lower grade categories by 4.63 times ($p < .01$) controlling for all other student- and teacher-level variables in the model.

Behavioral predictors

Grade 11 absences affected the predicted odds of earning a B± or A± grade in English 12 compared to earning a C± or D±, F, I grade across cohorts 2015, 2016 and 2017. Grade 11 absences, however, did not impact students' predicted odds of earning a B± or A± grade compared to the combined lower categories in cohort 2014. During cohort 2016, a 1-SD increase (14.2) in student school absenteeism rate from the mean (19.8) during grade 11 decreased the expected odds of earning an A± or B± grade compared to the combined lower grade categories by a factor of 0.54 (or reduced by 46%) ($p < .01$) controlling for both student and teacher level variables in the model.

Teacher absenteeism during cohort 2015, 2016 and 2017 was also related to students' likelihood of earning an A± or B± grade in English 12 compared to the combined lower grade categories. In cohort 2017, a 1-SD (5.6) increase from the average teacher absenteeism rate (5.0) significantly reduced student's predicted odds of earning an A± or B± grade in their English 12 course compared to the combined lower grade categories by 85 percent ($p < .01$), controlling for all other variables in the model.

Research Questions 3

A total of 268 students from the ASDOE 2014 cohorts enrolled at ASCC within a year following their high school graduation. Of the 268 students, a total of 212 students were included in the English analytic sample where initial English course enrollment was the outcome. Although the English sample did not have any missing high school teacher data, sample attrition was mostly due to a combination of missing outcome data (initial English course enrollment data) and other high school predictor variables which include SAT-10 and grades in English 12 course.

Results for descriptive statistics with Initial English course enrollment

Table 15

Descriptive statistics for student-level categorical variables

Variable	Coding convention	Cohort 2014 (n = 212)
Student gender	1 = Female 0 = Male	61.3 38.7
English 12 course grade	1 = A± or B± 0 = C± or below	86.3 13.7
Grade 12 SAT-10 Reading	1 = Basic or above 0 = Below basic	20.3 79.7
Special education status	1 = Yes 0 = No	1.4 98.6
On-time high school graduation	1 = Graduated on time 0 = Did not graduate on time	99.5 0.5
Initial English course enrollment	2 = English 151 1 = English 91 0 = Below English 91	13.2 23.1 63.7

Approximately 61.3 percent of the English analytic sample for research question 3 were females. Additionally, most of the students in the sample earned a B- or above on their high school English 12 course (86.3 percent) (Table 15). About 20 percent (20.3 percent) earned a "Basic" or above mark on the SAT-10 Reading standardized assessment that administered during

their senior year. Finally, 13.2 percent of students in the sample enrolled directly into college-level English (English 151) while 86.8 percent initially enrolled in remedial English courses. Descriptive statistics for special education status and on-time high school graduation were suppressed because less than 5 students were identified in one of these cells.

Table 16

Descriptive statistics for student-level continuous variables

Variable	Mean (SD)
Grade 12 percent of days absent	22.84 (13.59)
Grade 12 cumulative GPA	3.07 (.54)

The average grade 12 absenteeism rate and high school cumulative GPA and for students in the English analytic sample was 22.84 percent and 3.07, respectively (Table 16).

Results for Multilevel Logistic Modeling with Initial English course enrollment

No significant variation in the outcome attributable to teachers was identified during the variance component analyses therefore, descriptive statistics for teacher-level variables were not reported. However, the number of teacher-level units for each sample was reported under the note section of Table 17.

Table 17

Fixed and Random Effects of Student-level and Teacher-level Predictors on Multilevel models with initial English course enrollment

	Intercept only	Model with student-level predictors only
Intercepts		
Threshold 0 (Below English 91)	0.66 (.24)**	2.50 (.76)**
Threshold 1 (English 91)	2.06 (.31)**	4.66 (.78)**
Fixed Effects		
Student-level		
Gender		0.34 (.20) [1.41]
Grade 12 Z-CGPA		1.43 (.28)** [4.18]
Grade 12 SAT-10 Reading		1.91 (.36)** [6.77]
Grade 12 Z-absence		-0.56 (.17)** [.57]
English 12 course grade = A± or B±		1.29 (.83) [3.61]
Random Effect		
Teacher-level	0.51 (.38)	.099 (.17)

Note. (SE) = standard error; [OR]=odds ratio; High school English teacher-level units = 10.
*p<.05 **p<.01

Demographic predictors

Gender was not related to student's predicted odds of enrolling directly into college-level English versus enrolling in development English Writing courses 71, 81 or 91 (Table 17).

Academic performance predictors

High school cumulative GPA was related to student's likelihood of enrolling directly in a college-level English course compared to combined enrollment in the lower remedial English courses after controlling for all other variables in the model. More specifically, for 1-SD (.54) increase in students' cumulative high school GPA from the mean (3.07), the predicted odds of enrolling directly into a college-level English course versus enrolling into development English Writing course 71, 81 or 91was increased by 4.18 times ($p < .01$) after controlling for all other variables in the model. SAT-10 scores were also associated with the predicted log odds of direct

enrollment in college-level English compared to the combined lower categories. High school graduates from the 2014 cohort who earned at least a "Basic" score on the grade 11 SAT-10 Reading test increased their predicted odds of enrolling directly into college-level English course versus the combined lower category by 6.77 ($p < .01$) times compared to students who scored "Below Basic." Students' grades in their high school English 12 course in high school were not related to their initial English course enrollment at ASCC.

Behavioral predictors

Grade 12 absence was associated with students' predicted odds of direct enrollment into college-level English course versus enrolling in development English Writing courses 71, 81 or 91. More specifically, a 1-SD (13.59) increase in absenteeism rate during grade 12 in high school from the mean (22.84) reduced students' predicted odds of enrolling directly in English 151 by 43 percent ($p < .01$) versus enrolling into the combined lower remedial English Writing course.

Research Questions 4

A total of 268 students from the ASDOE 2014 cohorts enrolled at ASCC within a year following their high school graduation. Of the 268 students, a total of 211 students were included in the math analytic sample where the outcome was initial math course enrollment. Although the math sample did not have any missing high school teacher data, sample attrition was mostly due to a combination of missing outcome data (initial math enrollment data) and other high school predictor variables which include SAT-10 and grades Algebra 2 courses.

Results for descriptive statistics with Initial math course enrollment

Table 18

Descriptive statistics for student-level categorical variables

Variable	Coding convention	Cohort 2014 (n = 211)
Student gender	1 = Female 0 = Male	63.5 36.5
Algebra 2 course grade	1 = A± or B± 0 = C± or below	73.9 26.1
Highest math course attempted in high school	1 = Algebra 2 or below 0 = Pre-Calculus or above	65.4 34.6
Grade 12 SAT-10 Math	1 = Basic or above 0 = Below basic	17.1 82.9
Special education status	1 = Yes 0 = No	0.0 100
On-time high school graduation	1 = Graduated on time 0 = Did not graduate on time	99.5 0.5
Initial math course enrollment	2 = Math 151 1 = Math 90 0 = Math 80	13.3 5.2 81.5

Approximately 63.5 percent of the math analytic sample for research question 4 were females (Table 18). Additionally, the majority of the students in the sample earned a B± or above on their high school English 12 course (86.3 percent) and attempted more rigorous math courses (65.4 percent in high school. Less than 20 percent (17.1 percent) earned a "Basic" or above mark on the SAT-10 math standardized assessment that was administered during their senior year. Finally, 13.3 percent of students in the sample enrolled directly into college-level English (Math151) while 86.7 percent initially enrolled in remedial math courses.

Table 19

Descriptive statistics for student-level continuous variables

Variable	Mean (SD)
Grade 12 percent of days absent	21.39 (12.5)
Grade 12 cumulative GPA	3.17 (.49)

The average grade 12 absenteeism rate and high school cumulative GPA and for students in the math analytic sample was 21.39 percent and 3.17, respectively (Table 19).

Results for Multilevel Logistic Modeling with Initial math course enrollment

No significant variation in the outcome attributable to teachers was identified during the variance component analyses therefore, descriptive statistics for teacher-level variables were not reported. However, the number of teacher-level units for the sample was reported under the note section of Table 20.

Table 20

Fixed and Random Effects of Student-level and Teacher-level Predictors on Multilevel models with initial math course enrollment

	Intercept only	Model with student-level predictors only
Intercepts		
Threshold 0 (Math 80)	1.74 (.31)**	4.79 (.93)**
Threshold 1 (Math 90)	2.22 (.36)**	5.41 (1.01)**
Fixed Effects		
Student-level		
Gender		.01 (.33) [1.01]
Grade 12 Z-CGPA		1.72 (.59)** [5.61]
Grade 12 SAT-10 Math		0.45 (.53) [1.57]
Grade 12 Z-Absence		-0.17 (.21) [.85]
Algebra 2 course grade = A± or B±		.45 (.53) [1.57]
Attempted math course above Algebra 2		1.98 (.88)** [7.24]
Random Effect		
Teacher-level	1.13 (.60)	0.88 (.61)

Note. (SE) = standard error; [OR]= odds ratio; High school math teacher-level units = 16.
*$p < .05$. **$p < .01$.

Demographic predictors

Gender was not related to students' predicted odds of enrolling directly into college-level math course versus enrolling in development math courses Math 80 or Math 90 (Table 20).

Academic performance predictors

Both high school cumulative GPA and taking more rigorous math courses were associated with students' predicted odds of enrolling directly into a college-level math course. For high school cumulative GPA, a 1-SD (.49) increase in students' cumulative high school GPA from the mean (3.17) increased students predicted odds of enrolling directly into a college-level English course versus enrolling into development English Writing course 71, 81 or 91 by 5.61 times ($p < .01$) after controlling for all other variables in the model. Additionally, high school graduates from the 2014 cohort who took more advanced math coursework which includes Pre-Calculus, Calculus and Statistics increased their predicted odds of enrolling directly into college-level math course versus the combined lower remedial math courses by 7.24 ($p < .01$) times compared to students who did not attempt those courses. Students' grades in their high school Algebra 2 courses in high school was not related to their initial math course enrollment at ASCC.

Behavioral predictors

Grade 12 absences were not associated with students' initial math course enrollment at ASCC.

Research Question 5

A total of n=175 students were included in the final analytic sample size for research question five. Of the total student sample, about three quarters enrolled as full-time students during their first semester at ASCC, and approximately 40 percent earned an associate degree within three years of initial enrollment (Table 21).

Results for descriptive statistics with College Graduation

Table 21

Descriptive statistics for student-level categorical variables

Variable	Coding convention	Cohort 2014 (n = 175)
Student gender	1 = Female 0 = Male	64.6 35.4
Algebra 2 course grade	1 = A± or B± 0 = C± or below	74.9 25.1
Attempted math course above Algebra 2	1 = Pre-Calculus or above 0 = Algebra 2 or below	65.1 34.9
Grade 12 SAT-10 Math	1 = Basic or beyond 0 = Below Basic	16.6 83.4
English 12 course grade	1 = A± or B± 0 = C± or below	90.3 9.7
Grade 12 SAT-10 Reading	1 = Basic or beyond 0 = Below Basic	21.7 78.3
On-time high school graduation	1 = Graduated on time 0 = Did not graduate on time	99.4 0.6
Special education status	1 = Yes 0 = No	0.0 100
Enrollment status during the first semester	1 = Full-time 0 = Part-time	74.3 25.7
Seeking Associate degree	1 = Yes 0 = No	97.3 2.3
Earned associate degree	1 = Yes 0 = No	40.0 60.0

Less than a quarter of the sample earned “Basic or beyond” on both math and Reading content of SAT-10. Additionally, about three quarter of students in the sample earned a B± or above in Algebra 2 during high school, and approximately 90 percent earned a B± or above in the high school English 12 course. Finally, 65 percent of students in the sample attempted more rigorous math courses in high school which include Pre-Calculus, Calculus and Statistics.

Table 22. Descriptive statistics for student-level continuous variables

Variable	Mean (SD)
Grade 12 percent of days absent	20.92 (11.95)
Grade 12 cumulative GPA	3.18 (.47)

The average absenteeism rate for students included in the analytic sample was 20.92 percent, and the high school cumulative grade point average was 3.18 (Table 22).

Results for Cross-classified Multilevel Modeling with College Graduation

Results for the cross-classified modeling multilevel with college graduation that was modeled as an outcome are displayed in Table 23. The random effect component for both high school and college levels did not reveal a significant variability between groups, therefore only results for the student-level predictors are described in this section.

Table 23

Fixed and Random Effects of Student-level and Teacher-level Predictors on Multilevel models with College Graduation

	Intercept only	Model with student-level predictors only
Intercept		
	0.33 (.41)	0.63 (.12)
Fixed Effects		
Student-level		
Gender		0.07 (.17) [1.07]
Grade 12 Z-CGPA		2.29 (.18)** [9.86]
Attempted math course above Algebra 2		0.50 (.32) [1.64]
Grade 12 SAT-10 Math		1.08 (.51) [2.95]
Grade 12 SAT-10 Reading		0.29 (.55) [1.34]
Grade 12 Z-Absences		-0.03 (.01) [.97]
Full-time enrollment during the first semester		2.06 (.56)* [7.85]
Random Effects		
College English	0.77 (.75)	0.28 (.38)
High school English x College English	0.02 (.23)	0.04 (.29)

Note. (SE) = standard error; [OR] = odds ratio; HS English teacher-level units = 10; HS Math teacher-level units = 16; College-level English units = 4; College-level Math units = 3.
*$p < .05$. **$p < .01$.

Demographic predictors

Initial enrollment status was associated with students' predicted odds of graduating from college within three years. That is, students who enrolled full-time during their first semester at ASCC, on average, improved their predicted odds of graduating within three years by 7.85 times ($p < .05$) compared to students who enrolled part-time. Gender was not related to students' predicted odds of earning a college degree within three years at ASCC (Table 23).

Academic performance predictors

High school cumulative GPA was the only variable besides enrollment status in the model that was related to student's likelihood of earning a degree within three years of initial enrollment. More specifically, for a 1-SD (.47) increase from the mean (3.18) in high school cumulative GPA, the predicted odds of earning a degree within three years of initial enrollment was increased by 9.86 times ($p < .01$) after controlling for all other variables in the model.

Behavioral predictors

Grade 12 absences for high school graduates from cohort 2014 who enrolled at ASCC the following year was not associated with college graduation from ASCC within three years.

CHAPTER 5

DISCUSSION

This study aims to explain how student- and teacher-level factors contribute to students' college readiness and success in American Samoa. Both high school and college data for students who graduated from one of the six ASDOE public high schools and who entered the local college were examined to identify both achievement and behavioral measures that are associated with student's readiness and success in postsecondary education. Each outcome is discussed separately below.

High School Algebra 2 Grades

Since performance in high school Algebra 2 has been demonstrated to have a positive impact on college enrollment and graduation (Gaertner, Kim, Desjardins & McClary, 2014), the first research question examined in this study investigated leading indicators that are associated with Algebra 2 grades in American Samoa. Understanding leading indicators that are associated with Algebra 2 grades may be useful for local school leaders to inform school improvement efforts aimed at improving grades not only in Algebra 2 but also in more rigorous math courses like Pre-Calculus, Calculus, and Statistics.

To summarize the findings for the research question 1, performances on grade 9 SAT-10 math scores, 11th grade attendance, and 9th grade cumulative GPA were all strongly associated with student's likelihood of earning an A± or B± grade in Algebra 2 compared to earning C±, D±, F grades or Incomplete. Student attendance in 11th grade, however, did not predict grades in Algebra 2 in cohort 2014. This suggests that, in cohort 2014, the average school attendance did not vary significantly between students who earned an A± or B± grade, students who earned a C± grade or students who had a D±, F or Incomplete mark in Algebra 2.

Grade 9 cumulative GPA was a consistent predictor of students' Algebra 2 course grade across all four cohorts. Students who, on average, finished their 9th grade with a cumulative grade point average that was one standard deviation above the cohort mean significantly increased their odds of earning a B± or A± in Algebra 2. More specifically, students who finished their 9th grade with at least a 3.63 cumulative GPA across all four cohorts, on average, increased their odds of earning an A± or B± grade in Algebra 2 versus earning a C± grade or below.

Teachers' influences on students' Algebra 2 grades varied across cohorts. While teacher attendance was not associated with students' Algebra 2 course grades in cohorts 2015 and 2017, teacher attendance was significantly related to students' Algebra 2 grades outcome in cohort 2016. On average, Algebra 2 teachers who were absent for at least 27.9 percent of the school year in cohort 2016 was associated with a decrease in student's predicted odds of earning an A± or B± grade in Algebra 2 versus earning a C± or lower. Teachers who were absent for more than a quarter of the school year in American Samoa is considerably high given that the national definition for teacher chronic absenteeism is missing at least 10 percent (or 18 days) of the 186-day school year (average school year length) (Joseph, Waymack & Zielaski, 2014). Staff members from the American Samoa Department of Education explained that multiple efforts have been implemented over the years to both reduce the teacher absenteeism rate and to better capture teacher absence data. These efforts have substantially reduced teacher absenteeism rates (M. Mamea, personal communication, 2016). To illustrate the sizable reduction in teacher absenteeism rate for Algebra 2 teachers, the average teacher absence rate reduced by 71.4 percent from 2015 (14.7 percent) to 2017 (4.2 percent).

Student Special Education status, on-time high school graduation status, teacher degree attainment and Praxis I certification were not included in the model due to concerns about modeling categorical predictors where one of the levels accounts for virtually all the observations. For example, less than five teachers had Praxis I Math certification. Additionally, less than 5 teachers had less than a bachelor's degree. Modeling predictor variables with trivial observations in one level may not be useful because there is not enough information to help the model differentiate between possible outcomes (Wielenga, 2007). Thus, future studies may investigate the unique effect of teacher degree and Praxis I math certification on student achievement when enough cases are observed across levels (ideally, an equal number of cases across levels) for these categorical predictors. Although, Matagi-Tofiga (2011) found a significant relationship between teacher certification and students' performance on the SAT-10 standardized assessment in American Samoa, Matagi-Tofiga's study employed a bivariate analysis technique and did not control for student- and teacher-level variables such as the approach used in the current study.

In short, both student (grade 9 cumulative GPA, grade 9 SAT-10 math, and grade 11 attendance) and teacher-level (attendance) predicted grades in the high school Algebra 2 course. However, the extent to which these variables are associated with Algebra 2 course grades varies by cohorts. Additionally, more research is needed to examine the added effect of teacher degree attainment and Praxis I math certification on students' Algebra 2 course grades that were not addressed in this study due to limitations of the available data.

Results from research question 1 offers potential student performance metrics for educators in American Samoa to identify students who may be at risk of not passing the Algebra

2 course later in their high school years. In cohort 2014, for example, students who finished grade 9 with a cumulative GPA of 2.25 (which is one standard deviation below the mean of 2.94), or less perhaps represent a sub-population of the cohort who may benefit from additional support services during their sophomore year to better prepare them for future math coursework including Algebra 2. Furthermore, the combination of grade 9 cumulative GPA and SAT-10 math scores may also improve the accuracy of identifying students who may be at risk of not passing Algebra 2. For example, a student with a 2.25 cumulative GPA during his or her freshman year and who scored "Basic" on the SAT-10 math in 9th grade may benefit from additional support services. On the other hand, a student who also scored "Basic" on the SAT-10 math but had a 3.5 cumulative GPA (which is a common occurrence observed in the data) in 9th grade, may advance to their next math sequence. Although the latter student may benefit from the additional math support services, preference may be given to students who were identified to be at risk of failing Algebra 2 based on the cumulative GPA and SAT-10 indicators, especially if limited resources are available to sustain these additional services.

Finally, there remain unexplained teacher-level variances across cohorts 2015, 2016 and 2017 that are associated with Algebra 2 course grades that were not explained by the variables (both student and teacher-level) in the model. It is possible that Praxis I certification and degree attainment may account for these unexplained variances but were left out because of statistical limitations. Additionally, the variables included in the model are often the "usual" suspects in many predictive studies in education and thus may only explain a portion of the variation in student achievement (Stephan, Davis, Lindsay & Miller, 2015). Perhaps, expanding our examinations of factors associated with student achievement to include teachers' socio-emotional aptitude or pedagogical strategies that are context specific might offer more explanatory power

in understanding student achievement in math. Nevertheless, results from the current study offer baseline information to inform future studies which may investigate the added influence of both students' and teachers' social and emotional contributions to student outcomes.

High school English 12 grades

According to the American Samoa Department of Education English Language Arts content standards for secondary education (2015), there are five English Language Proficiency (ELP) standards which describe the expectations for student English literacy. These ELP standards are set by grade-level expectations in four content areas which include listening, speaking, reading and writing. The standards were designed to address both "the (1) social language needed for social, intercultural, and classroom communication, and the academic language needed for ELLs to learn in the core content areas of (2) language arts, (3) mathematics, (4) science, and (5) social studies" (p. 6). The ELA content standards not only inform the development of high school English courses at ASDOE but also specify the "literacy skills and understandings required for college and career readiness in ELA/English…" (p. 10). Thus, selecting an English course that would yield the most impact in preparing students for college-level English was a primary concern for research question 2. Unlike high school math courses, high school English courses vary greatly between schools. In addition, ranking English courses is often difficult, partly, because of varying emphases on different proficiency standards to inform course designs and learning objectives.

To address this issue, the last English course that most high school seniors attempted in their final year of high school was identified as the outcome for research question 2. As mentioned previously, close to ninety percent of seniors took English 12 as their final English

course in high school. Results from research question 2 may be useful for school practitioners to inform school-based improvement plans aimed at improving students' grades in this course, which could also prepare them for college-level English courses.

To summarize the results for research question 2, SAT-10 English scores, 11th grade attendance, 9th grade cumulative GPA and gender performed variably across cohorts in predicting students' likelihoods of earning an A± or B± grade in English 12 compared to earning C±, D±, F or an Incomplete grade. Like findings from research question one, student attendance in 11th grade did not predict English 12 course grades in cohort 2014. This suggests that school attendance did not vary significantly between students who, on average, earned an A± or B± grade, students who earned a C± grade and students who earned a D±, F or Incomplete mark in English 12. On the other hand, school attendance was statistically different between students who, on average, earned an A± or B± grade compared to students who earned a C± or below for cohort 2015, 2016 and 2017. Grade 9 cumulative GPA was a consistent predictor of students' English 12 course grade across all four cohorts. In addition to these performance measures, female students seemed to perform better in English 12 compared to male students in cohort 2014 and 2017. Female students, on average, increased their predicted odds of earning an A± or B± grade versus earning a C± or below in their English 12 course by 1.81 to 1.83 times (p<.01) compared to males in cohort 2014 and 2017, respectively.

Teacher attendance was associated with students' grades in English 12. For example, teacher attendance was strongly associated with students' English 12 course grades in cohort 2015, 2016 and 2017. This finding is perhaps noteworthy for at least two reasons. First, since teacher attendance was the only significant predictor that explained the level-2 variance attributable to teachers, this suggests that English teachers play an invaluable role in developing

English language proficiency among English Language Learners in American Samoa. Moreover, the ubiquitous use of the Samoan language across various forms of interactions among Samoans further demonstrates the importance of increasing opportunities and experiences for students to learn English in school classrooms. Unfortunately, when teachers do not show up to school, it becomes a missed opportunity for students to improve their English literacy skills.

Brown, Crites, Koki, Leroux, Mauricio and Onikama (1998) reported that family member illness, funerals, personal illness, meetings and workshops, and vacations were among the top five reasons teachers were absent from schools across ten Pacific island entities with political ties to the United states which include Hawai'i, American Samoa, Palau, Commonwealth of the Northern Mariana Islands, Guam, Republic of the Marshall Islands and the Federated States of Micronesia. Funerals, more specifically, have unique cultural implications for teachers in American Samoa. As Uehara (1999) explained,

> When a funeral is held for a relative or in-law, family members are obligated to attend. In some instances, mourning the death of a family member can take anywhere from three to five days, or longer if the funeral takes place on an outer island. This cultural responsibility inevitably results in an educator's absence from school. (p. 7)

To be clear, results from this study do not imply that teacher absenteeism causes low student performance in the English 12 course. However, results from research question 2 provide further evidence that is consistent with previous studies in the Pacific region exploring the negative impact of teacher absenteeism on student outcomes (Uehara, 1999). From a policy standpoint, local leaders may consider feasible strategies that can, for example, accommodate teachers' participation in cultural events like funerals. This type of accommodation perhaps

redefines the issue by viewing teacher absenteeism as a symptom rather than a cause. Thus, exploring the unique and underlying causes of teacher absenteeism may help local leaders find local solutions to address this issue.

The second reason why the relationship between student achievement and teacher absenteeism is significant is that understanding specifically what teachers do in the classroom may help educators better understand instructional practices and pedagogies that are most aligned with the learning needs of English Language Learners in American Samoa. With most high school students scoring "Below Basic" on the SAT-10 Reading and the subsequent high enrollment rate in English remedial courses at ASCC in the last decade (ASCC Annual Report, 2016), results from research question 2 offers further evidence to justify future lines of study that look specifically into English teachers' impacts on improving English language proficiency among American Samoa's school-aged youth. Based on the author's past experiences of working with educational leaders in the Pacific region, bringing research evidence to bear on practice is often complicated and unpredictable.

In 2015, ASDOE implemented a Dual Language pilot program as part of its 5-year Comprehensive School-Based Improvement Plan (American Samoa Department of Education, 2014) with the goal of improving students' proficiencies in the English language. Then ASDOE Director, Vaitinasa Dr. Salu Hunkin-Finau, explained that in the past 20 years, 70 percent of ASDOE students in grades 3, 5, 7, and 10 scored below basic on English and math proficiency tests and that the goal of the Dual Language program was to improve proficiency in these content areas (Samoa News, 2015). A key component of the Dual Language program trains teachers to

provide instructions in the Samoan Language then transition into English as students' progress through the grade levels.

Although the design of the pilot program was informed by previous studies showing improvements in student scores when instructions are initially taught in the primary language (for example, see Marian, Shook & Schroeder, 2013), there was strong resistance from both community members and lawmakers questioning the legality of the program. Part of the concern stemmed from parents' experiences of the Samoan language being spoken everywhere in the home, church and other community events and that the school is where they expected their students to learn English. One parent was puzzled when their children came home with an assignment in the Samoan language when they were sent to school to be taught English (Samoa News, 2015). The implementation of ASDOE's 5-year Comprehensive School-based Improvement Plan (CSBIP, 2015) aimed at improving, among other things, English proficiency in American Samoa, and offers an example of implementing small changes in the classrooms with macro-level implications. As demonstrated in this paper's introduction, students' educational experiences are not only influenced by teachers at the microsystem but also at the macrosystem through territorial rules and regulations that govern the education system in American Samoa.

Initial English and math course enrollment

Since the analytic sample for questions 3 and 4 follow only high school graduates from cohort 2014, results for both initial English and math course enrollment are discussed together in this section. Interpreting the results for research questions 3 and 4 should introduce the possibility that the independent variables in both models may perform variably across incoming

cohorts in predicting initial English and math course enrollment as demonstrated in research questions 1 and 2.

To summarize, high school cumulative GPA was the only predictor that was associated with initial English and math course enrollment at ASCC for incoming high school graduates in cohort 2014. In the initial English course enrollment outcome model, grade 12 SAT-10 Reading score and grade 12 student attendance were associated with students' initial enrollment into college-level English course (English 151) compared to enrolling in remedial English courses – English 91, 81, or 71. Grades in the high school English 12 course did not predict students' odds of initial English course enrollment. Moreover, there was not enough level-2 variance to include high school teacher-level predictors in both English and math model. Results for research question 4, which regressed initial math course enrollment on six student-level predictors revealed that, in addition to high school GPA, attempting more rigorous math courses above Algebra 2 was associated with enrolling directly into a college-level math course.

In American Samoa, preparation for college-level coursework seems to vary by content areas. In math, taking high school math courses beyond Algebra 2, on average, improved students' predicted odds of enrolling directly into college-level math course Math 151 by 7.24 times ($p < .05$) compared to enrollment in remedial math courses Math 91 and Math 81. This finding is consistent with previous studies both in the US (Adelman, 2006; Atkinson & Geiser, 2009; Burton & Ramist, 2001; Porter & Polikoff, 2012) and in the Commonwealth of the Northern Mariana Islands (Herman, Carreon, Scanlan & Dandapani, 2017), linking the positive effect of taking more rigorous math courses in high school to college readiness. Algebra 2 course performance, however, did not predict initial math course enrollment for entering first-time freshmen students in cohort 2014. This finding builds upon a recent research study by Herman,

Carreon, Scanlan and Dandapani (2017) examining the academic preparation of high school students in the Commonwealth of the Northern Mariana Islands (CNMI) and their initial math course enrollment at the local Northern Marianas College (NMC). Although Herman et al. found a significant difference in the proportion of students who earned a B grade or higher in Algebra 2 that initially enrolled in college-level math course compared to their peers who initially enrolled in remedial math, the study employed a bivariate analysis method and did not control for other variables (for example, AP math courses or taking math courses beyond Algebra 2) that may be associated with initial math course enrollment in college. The current study addresses this limitation by examining the unique effect of Algebra 2 course grades on initial math course enrollment in the face of other related variables in the model which include gender, high school cumulative GPA, grade 12 SAT-10 math scores and attempting math courses above Algebra 2. Performance in high school Algebra 2 did not predict any unique variance in the model that was above and beyond the effect of taking more rigorous math courses in high school and cumulative GPA. Moreover, the current study contributes to examining college readiness in American Samoa by controlling teachers' influences on initial math course enrollment.

In English, performance in the high school English 12 course for first-time freshmen in cohort 2014 did not predict initial English course enrollment at ASCC. It is possible that students who took other English courses like Public Speaking or Reading Comprehension, for example, in their senior year might offer more explanatory power in predicting initial English course enrollment compared to English 12 (see Appendix B). As mentioned earlier, ranking English courses posed a methodological concern for this study since high school students can choose different combinations of English course offerings to make up the required four credits in English to graduate. Examining the relationship between high school English course-taking

patterns and their effects on initial English course enrollment at ASCC may be a worthwhile focus for future studies.

The fact that many students are referred to remedial English in their first semester at American Samoa Community College suggests that many incoming freshmen at American Samoa struggle with learning and attaining proficiency in academic English. Ropeti (2014) explained that part of the reasons why remedial English students at ASCC struggle in their English courses can be attributed to cultural and social norms that students adopt in their learning. For example, some students are uncomfortable communicating in English because of their perceived inadequacies in conveying their ideas or thoughts to the teacher and especially in front of a class audience. These perceived inadequacies reinforce their reluctance to ask questions to check their understanding. One student explained that, "Sometimes I want to ask questions, but I am ashamed of other students, I think that if I ask questions, something is wrong and they laugh." (p. 67). As a result, this socially accepted norm of not asking questions to check for understanding is negatively reinforced when students are spared from shame and embarrassment. For some students, tuning out the classroom instruction is much easier to do than wrestling with the decision to ask a question. As one student lamented, "I don't listen to the teacher, I ignore the teacher because I don't understand instruction, I am ashamed and embarrassed to ask…" (p. 67). Ropeti (2014) suggested that these classroom norms are not unique to college students entering ASCC but rather an ingrained practice that may have started earlier in elementary and high school. Ropeti explained that,

> Samoan students in many school settings beginning from preschool to high school are always asked by teachers after teaching a lesson if they understand. It was a widely common question that in many school conditions children are taught to respond

> respectively saying “yes I understand” when in reality many of them do not. In many situations, students will reply in a chorus of “malamalama faafetai” translated “we understand thank you” and anyone who reacts differently is shunned, ridiculed or teased by the community of learners. This repetitious response has been a practiced tradition in many Samoan schools not included in policy but an inherent exercise to ensure discipline and formality in a learning environment. (p. 67)

Ropeti’s (2014) insightful observation of why students’ are struggling in English at ASCC perhaps offers a theoretical foundation for future a line of work that aligns with the results of this study. More specifically, the results from this study shows that teachers who show up to school have a significant influence on students’ grades in the English 12 course. However, it is not yet clear what these English teachers are doing in the classroom that influence their students’ grades. Findings from Ropeti’s (2014) qualitative analyses showed that ASCC college students appreciated English instructors’ use of bilingual instruction. These college students also recommended that English instructors speak slowly during classroom instructions and to make time to talk with their students after class. These specific feedback and recommendations from ASCC remedial English students offer practical strategies that may be useful for K-12 English teachers. Moreover, future lines of studies might investigate how these specific instructional strategies are related to English proficiency among American Samoa’s school-aged youth in grades K-12.

Since high school cumulative GPA was the only significant predictor of initial English and math course enrollment at ASCC, local leaders at both ASDOE and ASCC may consider using high school GPA for placement decisions as has been done in other postsecondary institutions across the nation and in the Pacific region. Because grade point average has been

shown to correlate strongly with the four outcomes examined so far, local leaders may consider using student's GPA for important decisions on resource allocation to improve student performances in English and math courses that are key to college preparation and initial course placement decisions at the college level.

College graduation

Results from research question 5 revealed that high school cumulative GPA continues to be a strong and robust predictor of college readiness and success in American Samoa, controlling for all other variables in the model. This finding is consistent with previous research on the relationship between high school GPA and performance in postsecondary performance (Atkinson & Geiser, 2009; Porter & Polikoff, 2012). As expected, full-time students increased their predicted odds of graduating from college within three years by 7.67 times ($p < .01$) compared to students who enrolled part-time. Because full-time enrollment is strongly associated with students' predicted odds of graduating within three years, the American Samoa Community College might consider feasible strategies to increase to the number of first-time freshmen enrolling full-time during their first semester. One possible strategy might include offering scholarships to first-time freshmen who enroll in at least 12 credit hours during their first semester at ASCC.

Results from research question 5 indicate that while high school preparation through attendance, SAT-10 scores and taking more rigorous math courses seem to prepare students for their first college-level English and/or math courses, these variables, however, were not related to students' likelihood to graduate from college within three years. Since the data were modeled using the cross-classified multilevel technique, initial course enrollment was held constant to examine the unique student-level influence on college graduation. As described in the method

section, the cross-classified multilevel analyses improve data modeling by partitioning the outcome variance according to its presumed hierarchical structure. Students were nested in both high school and college classrooms. Thus, failure to model the data appropriately violates the data dependency assumption which could lead to erroneous claims about the relationships between the predictors and the outcome.

Implications

This study examined the effects of student- and teacher-level characteristics at the high school level on students' college readiness and success in American Samoa. Results from this study offer valuable information for administrators and practitioners in the American Samoa Department of Education and American Samoa Community College to support students who are at risk of not being college-ready upon graduation from high school. More specifically, results from the study suggest that raising the academic preparation trajectory in high school and using high school data, including high school GPA, course taking, and test performance for placement decisions may help improve students' transitions from high school to college.

First, taking more advanced math courses beyond Algebra 2, including Pre-Calculus, Calculus and/or Statistics, increases students' likelihood of enrolling directly into college-level math. Therefore, raising the math standards by introducing Algebra 2 as early as 9th grade may allow more students to attempt more advanced math courses before they leave high school. Raising the math learning trajectory, however, cannot be achieved without raising the expectations from Kindergarten to 8th grade as well. Thus, revisiting the curricula for both English and math and identifying feasible strategies that would allow students to take more advanced English and math courses prior to graduation may help them better prepare for college-level coursework. Raising the K-12 academic trajectory to allow more students to take Pre-

Calculus, Calculus and Statistics before leaving high school in American Samoa will demand systemic change not only within the American Samoa Department of Education but also support from the local congress and the community at large. For example, introducing Algebra 2 in 9th grade requires hiring, training and retaining qualified math teachers to teach Algebra 2 and the higher-level math courses that were previously mentioned. Lawmakers can support this systemic change, in part, by ensuring that teachers are equipped with adequate classroom resources and are compensated fairly. According to the Hawaii State Teacher Association (HSTA), the number of teachers in Hawaii who resigned from the profession and moved to the continental US increased by 84 percent from 2010 to 2017 (Gonzalez, 2018). Part of the reason for this hike in teacher attrition is low pay after factoring the high cost of living in Hawaii. The author acknowledged the logistical challenge of introducing Algebra 2 earlier in high school, however results from this study offers preliminary evidence to support this effort which would ultimately prepare American Samoa's youth for college-level courses.

Second, high school grade-point average perhaps captures more than just intellectual abilities in predicting college readiness and success. As Duckworth, Peterson, Matthews and Kelly (2007) argued, personality traits like perseverance and passion, or what they term "grit," may explain some of the variances in student achievement that are not accounted for by academic performance. It is possible, however, that high school GPA is a composite construct of both personality and intellectual ability. For example, students with high cumulative GPA are not only intellectually competent, but they also understand the skills, behaviors, and dispositions necessary to do well in school. Moreover, these students and their teachers have a shared understanding of each other's roles and expectations resulting in students' abilities to successfully navigate the education system. With that said, high school GPA can be an

invaluable data point for making high-stakes decisions about students' propensity to be successful in college. In short, local leaders from both educational institutions (ASDOE and ASCC) may wish to explore ways to maximize the use of high school GPA in placement decisions.

Finally, results from this study may foster discussions between the American Samoa Department of Education and the American Samoa Community College about how well-aligned high school standards, expectations, and coursework are with college courses, standards, and expectations. Improving college readiness should be a shared responsibility between K-12 and postsecondary institutions, especially in Pacific-island jurisdictions where there is only one local community college. Part of this effort might include aligning curriculum standards and assessments from high school to college and framing this critical transition as a natural extension of the K-12 curriculum. Doing so may help curriculum developers and educators articulate the prerequisite knowledge and skills students need to be successful at the next grade level.

Limitations

There were three potential limitations for this study: the generalizability of the college outcome results, the exclusion of some teacher-level variables, and the issue of power concerning the small sample size.

First, the generalizability of the results for research questions 3-5 may be limited. Since only high school graduates from the 2014 cohort were included in the analytic sample, inferences from the results may be limited only to that specific high school cohort. As demonstrated in research questions 1 and 2, leading indicators of student performance in Algebra 2 and English 12 high school courses varied by cohorts. It is possible, therefore, that leading indicators

associated with initial English and math course enrollment and college graduation may vary across incoming cohorts at ASCC. Additionally, high school graduates from the four private schools in American Samoa were not included in this study, and thus the results may apply only to public high school graduates from the 2014 cohort.

Second, some student- and teacher-level variables were excluded from the multilevel analyses due to the trivial number of observations observed in one of the levels. Student-level variables that were excluded from the analyses included on-time high school graduation and students with special education status. On-time high school graduation variable were defined as students who repeated a grade level anytime during their high school enrollment. Teacher-level variables that were excluded from the analyses include. For example, less than five teachers had Praxis I Math certification. As Wielenga (2007) reported, modeling categorical predictor variables with trivial observations in one level may not be useful because there is not enough information to help the model differentiate between possible outcomes.

Finally, because the final analytic samples for the study were relatively small, determining the number of independent variables that can reasonably be included in the models was a concern due to the issue of power. Although power can be manipulated with sample size (Van Vorhiis & Morgan, 2007), identifying the appropriate number of cases to be included in the study was limited by availability of data from both ASDOE and ASCC. It is possible that the model may fail to detect associations between some of the independent variables and the outcomes due to the small sample size. Some researchers recommended having at least 10 cases per parameter (e.g., Bentler & Chou, 1987; Kline, 2005; Vittinghoff & McCulloch, 2006) when considering how many independent variables to include in regression models. The inclusion of

specific independent variables in the model, however, was based on both theory and statistical considerations.

Conclusion

Understanding and addressing problems of practice in education through rigorous scientific inquiry is a guiding philosophy of educational psychology (Berliner, 1993). As Berliner explained, "it is the problems of the field that are the origins of our interests as psychologists…This formulation recognizes both the importance of understanding the problems of individuals struggling to make schooling successful and the importance of our disciplinary perspective" (p. 25). Problems of practice in education are messy and can be difficult to disentangle. These problems are often exacerbated by claims of "effective interventions" that overlook outcome variability among latent subgroups in the population (Bryk, 2017).

This study contributes to ongoing improvement efforts in American Samoa by first addressing a pernicious problem in education that spans from elementary to high school and college – that is, the fact that many high school students in the Pacific region are academically unprepared for postsecondary coursework. Second, recent advances in the field of measurement and statistics offer educational researchers a unique opportunity to empirically examine subgroup variability in students' college readiness and success outcomes. Multilevel modeling provides a powerful tool for decomposing the inherently nested nature of educational data by examining both student-level and teacher-level contributions.

Moreover, the influence of a single educational institution alone will only account for a portion of the variation in students' academic achievement. Examining other macro-level influences that are a part of students' ecosystems, such as their college experiences, can offer

additional explanatory power in understanding students' transitions from high school to postsecondary education.

The application of multi-level models provides useful information to understand the extent to which students' college preparation and success can be attributed to activities across the interrelated spheres of influence within their ecosystem. As such, the application of multi-level model captures, to some degree, the macro-level influences of high school students, high school teachers and college instructors on American Samoa's college-bound high school graduates. Finally, the advent of multilevel analysis and the availability of quality data at ASDOE, from the K-12 system to the postsecondary level creates a fortuitous opportunity to examine college readiness in a way that has never been done before in American Samoa.

Appendices

Appendix A

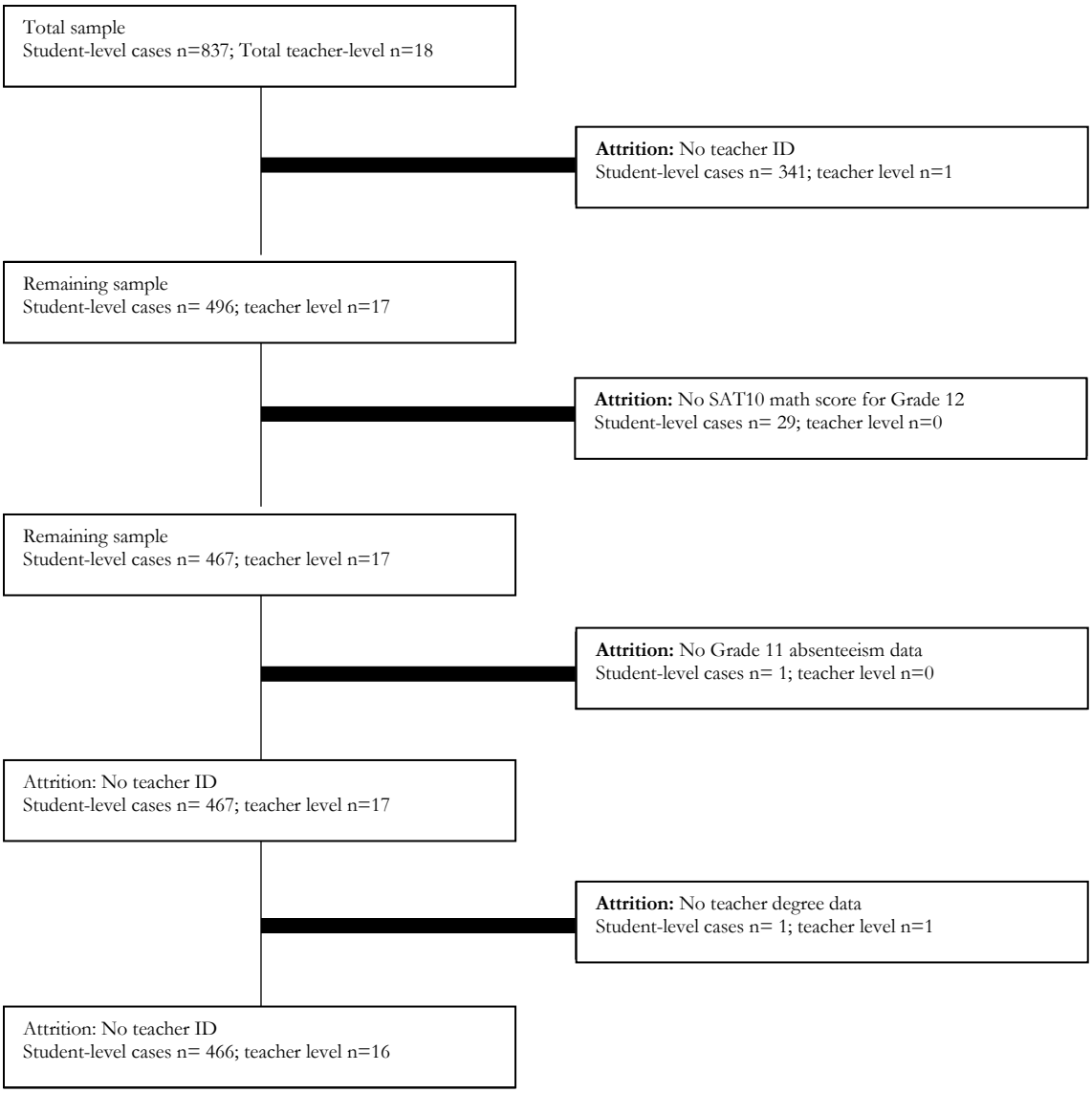


Figure A1. Cohort 2014 Math sample attrition.

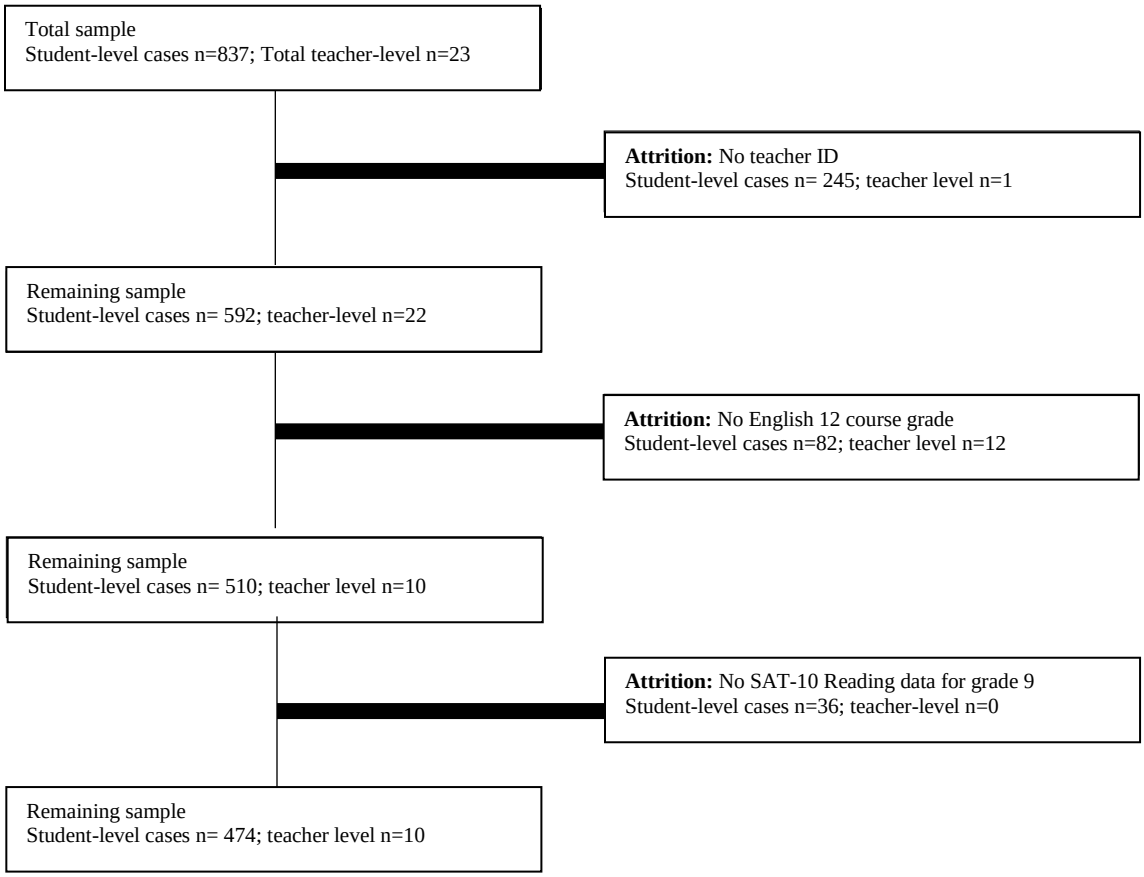


Figure A2. Cohort 2014 English sample attrition.

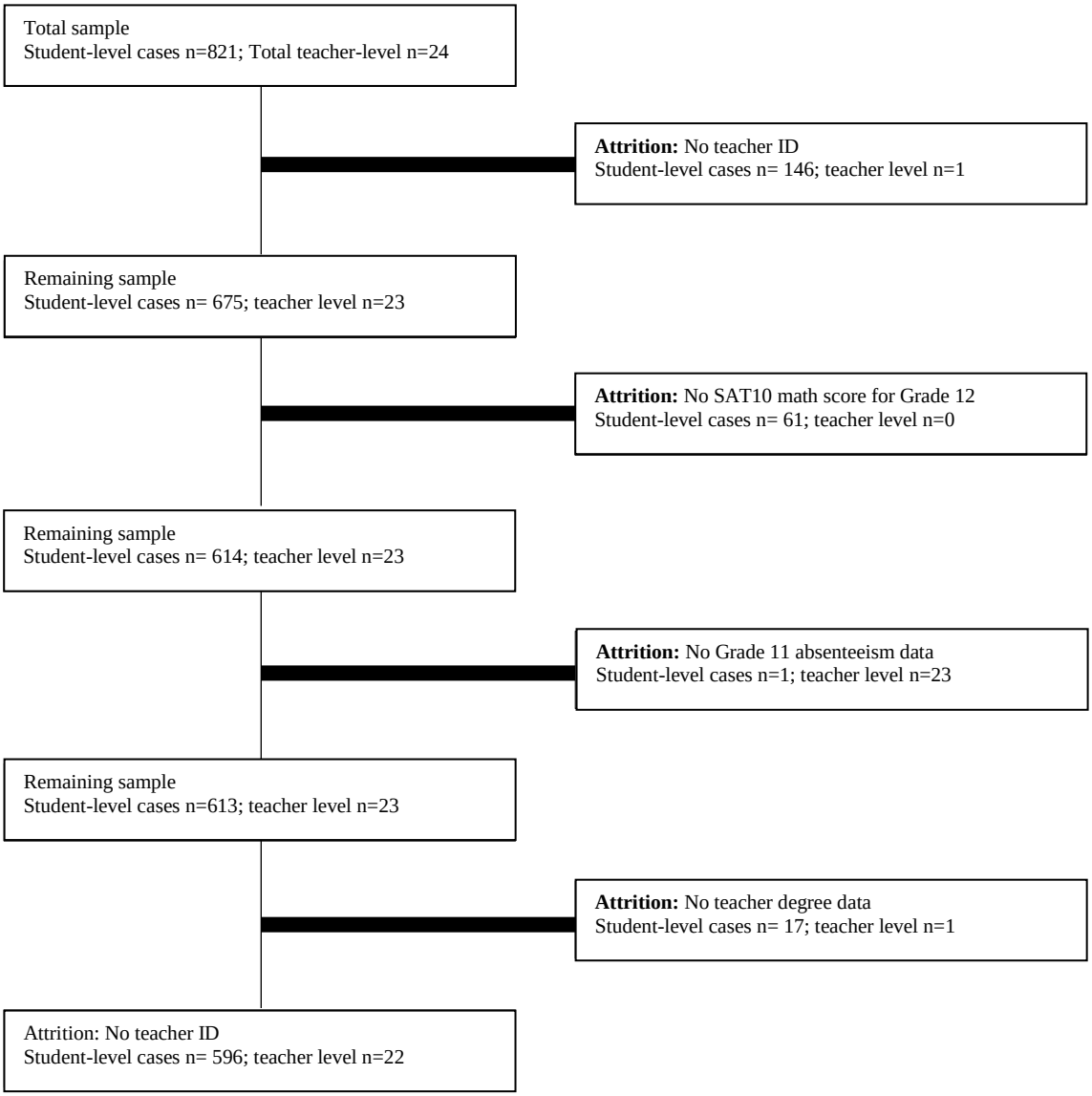


Figure A3. Cohort 2015 Math sample attrition.

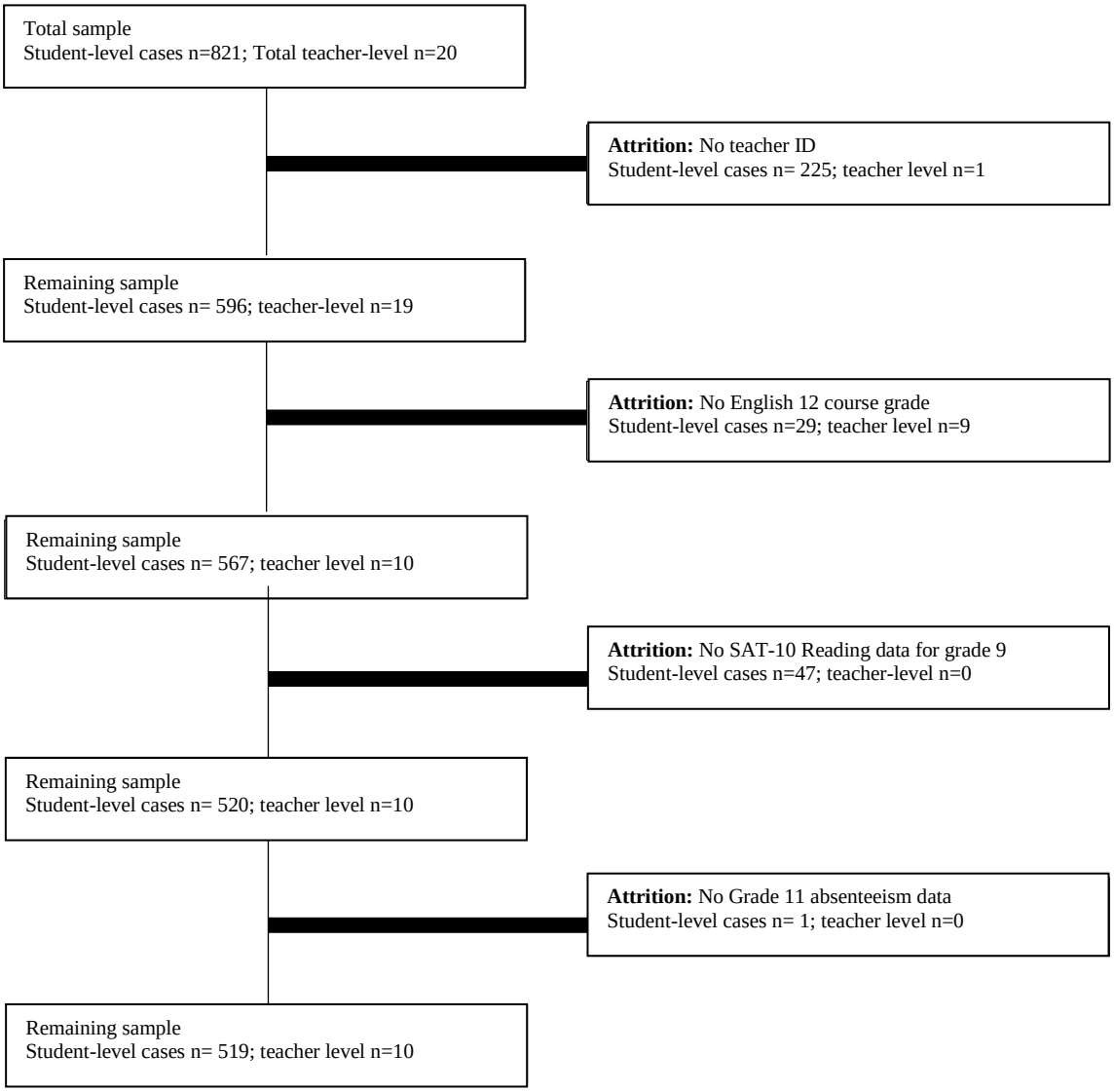


Figure A4. Cohort 2015 English sample attrition.

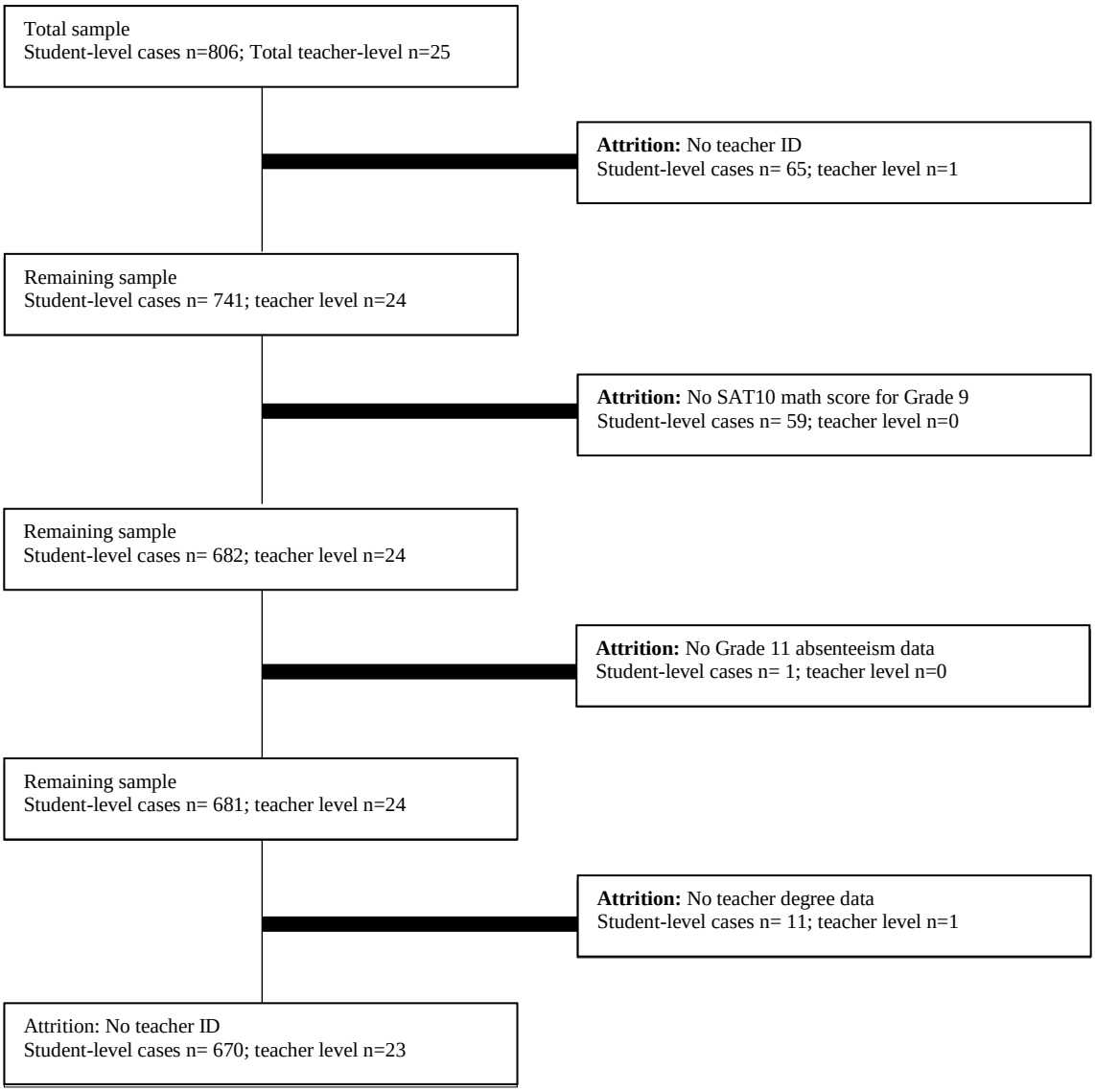


Figure A5. Cohort 2016 Math sample attrition.

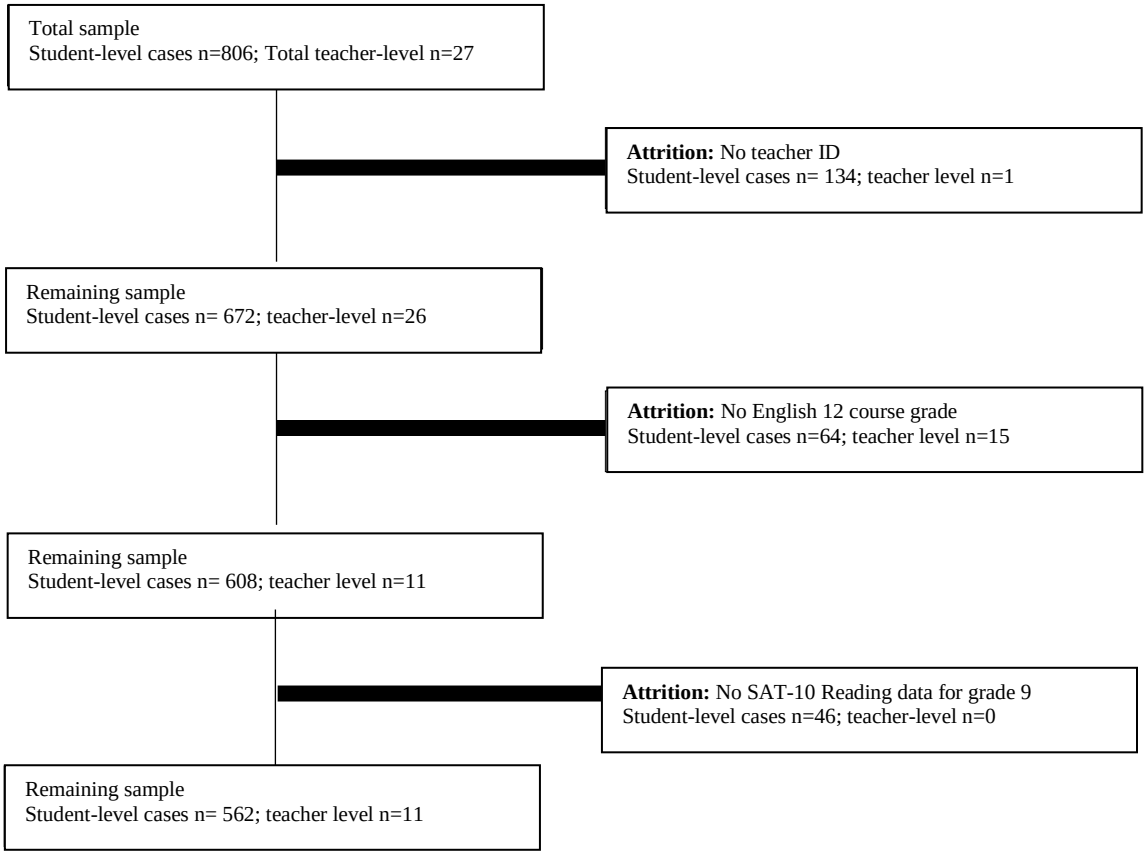


Figure A6. Cohort 2016 English sample attrition.

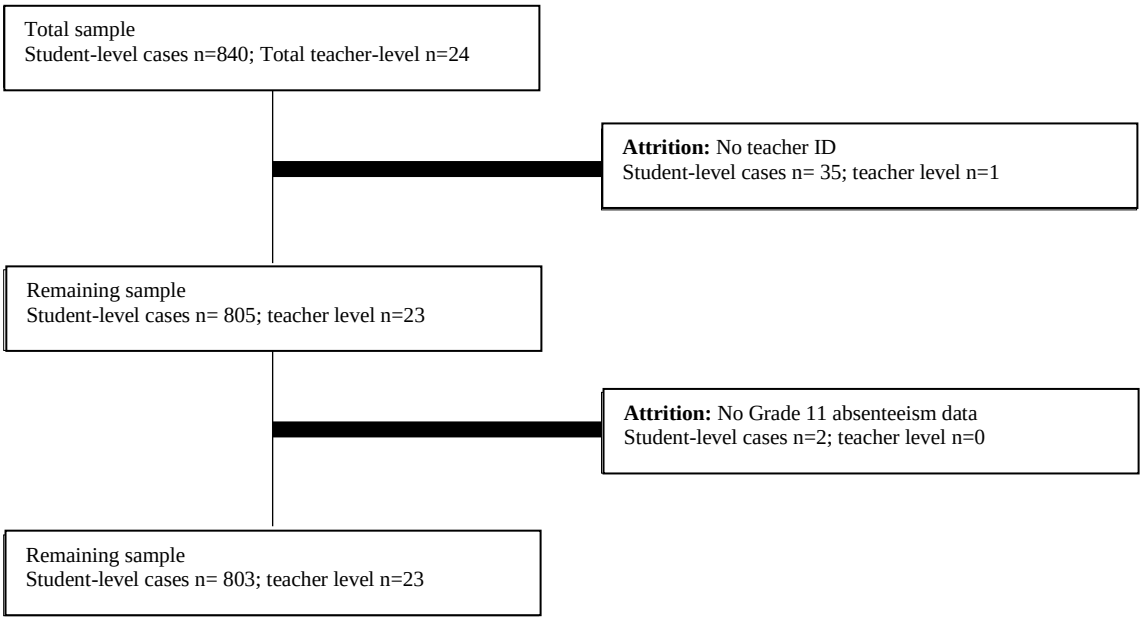


Figure A7. Cohort 2017 Math sample attrition.

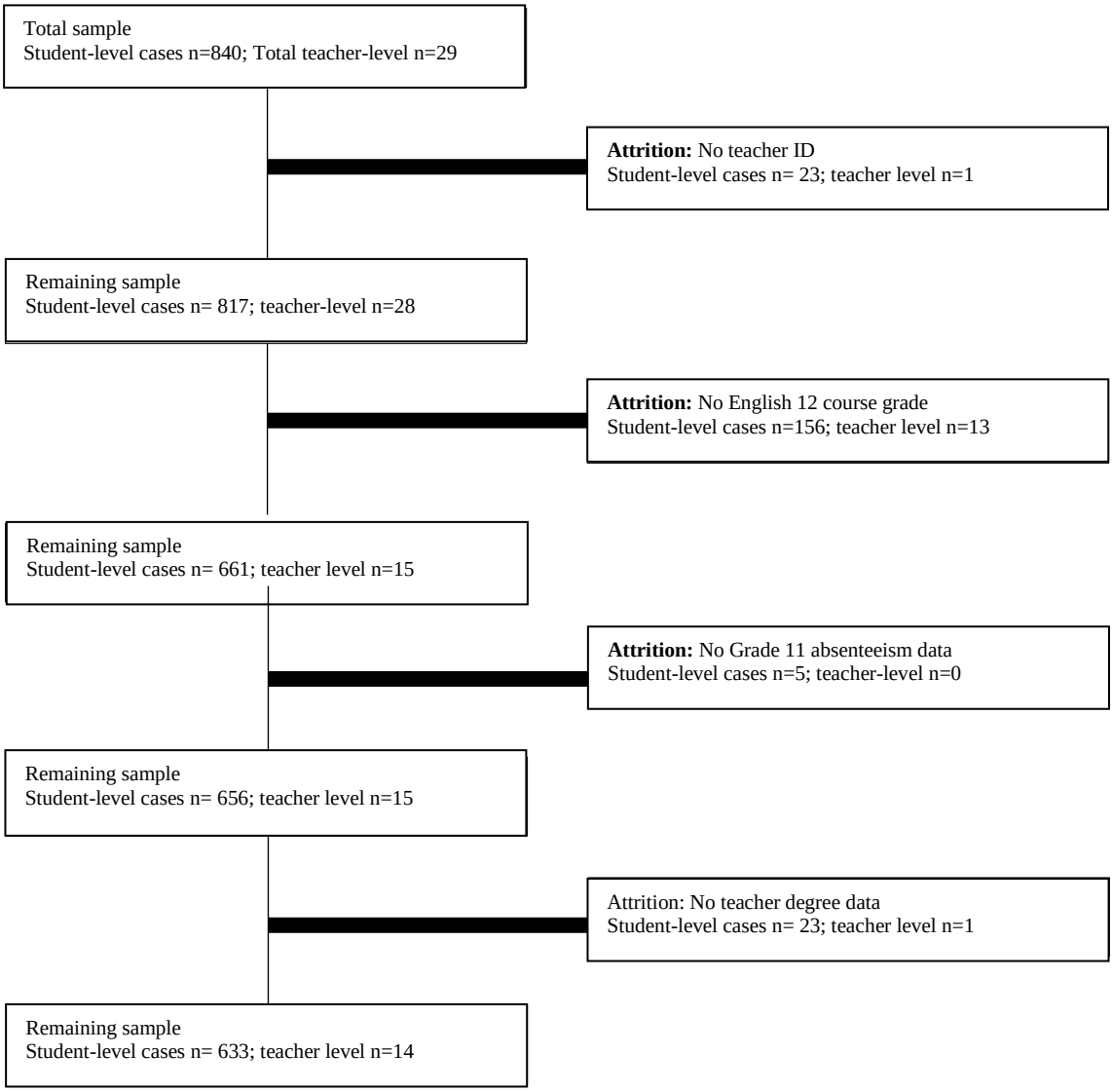


Figure A8. Cohort 2017 English sample attrition.

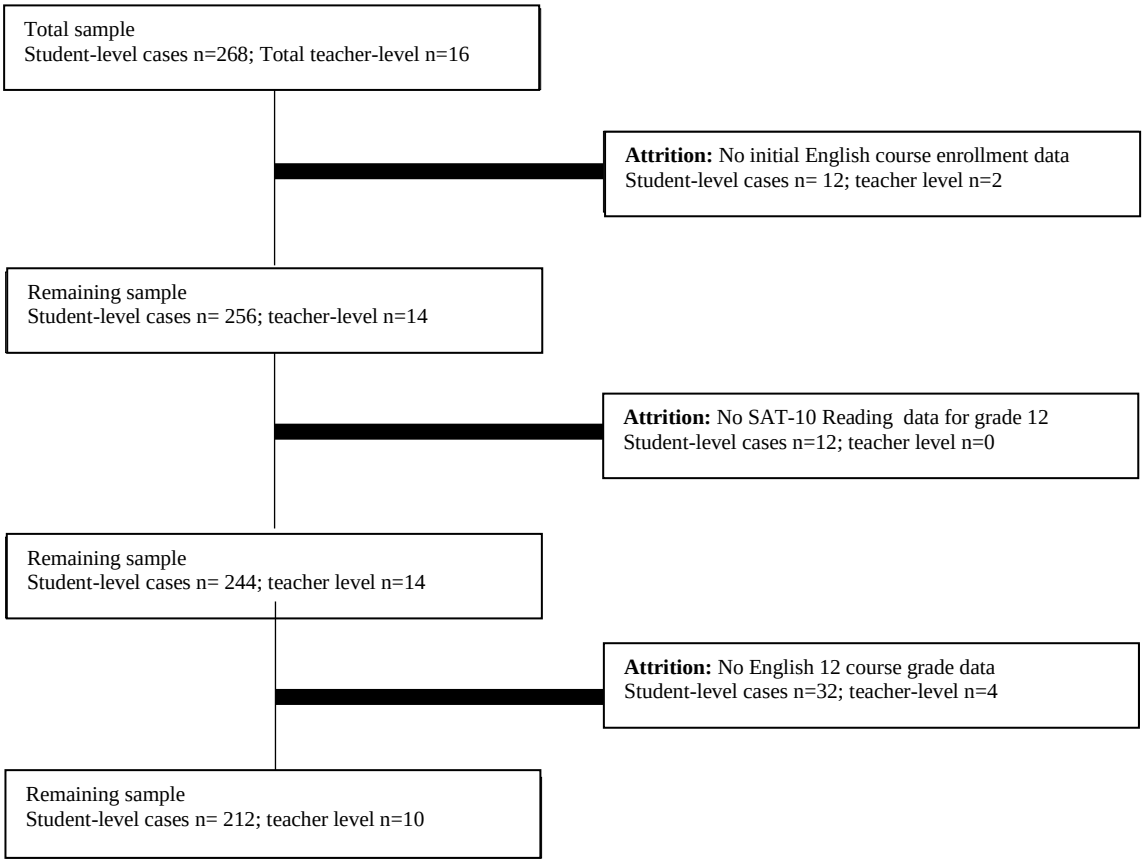


Figure A9. Cohort 2014 college sample attrition – Initial English course enrollment.

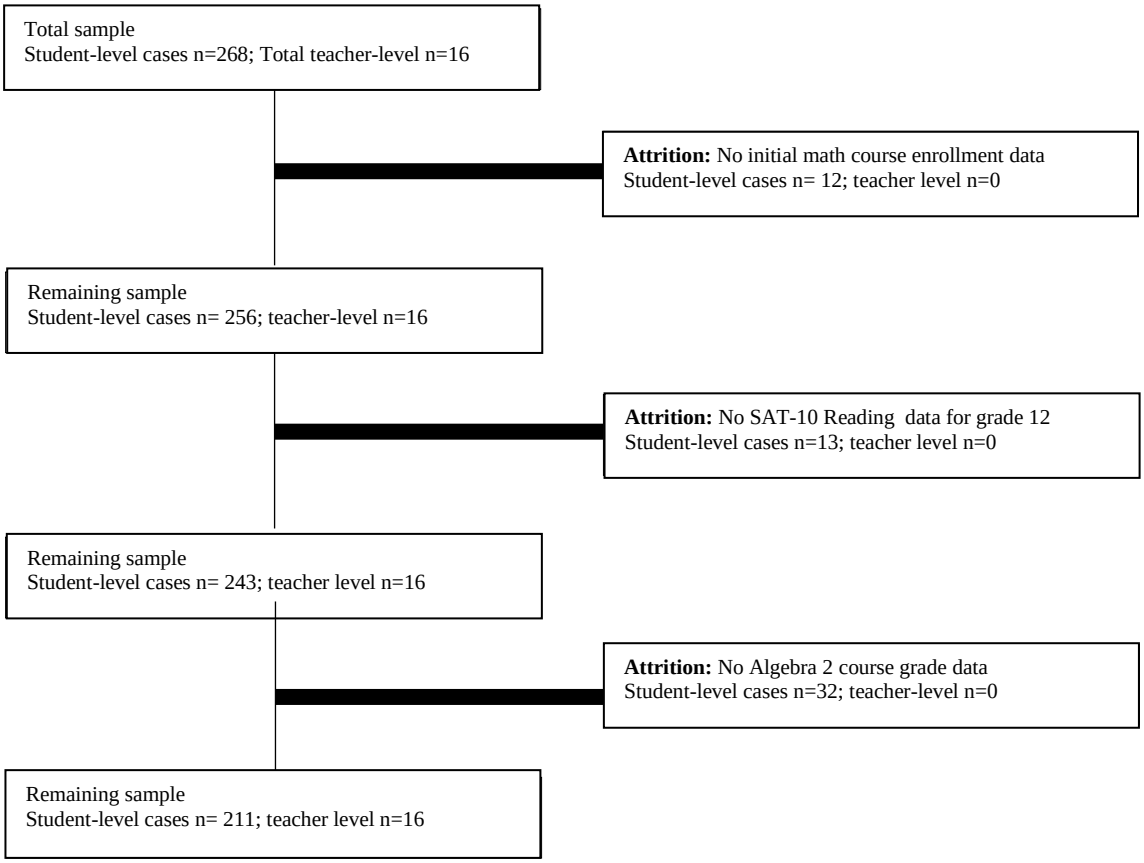


Figure A10. Cohort 2014 college sample attrition – Initial math course enrollment.

Appendix B

Table B1

English course catalog at ASDOE

ASDOE English course catalog for high school	Grade
Decoding	9
Reading Comprehension	9
English 9	9
English 114	9
Decoding	10
Reading Comprehension	10
English 10	10
English 116	10
Decoding	11
Reading Comprehension	11
English 11	11
English 118	11
SAT English Prep	11
Public Speaking	11
Decoding	12
Reading Comprehension	12
English 12	12
Public Speaking	12

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